

Appendix F – Goals, Objectives, and Strategies

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Waterfowl Population Objectives for Lower Klamath and Tule Lake Refuges

There are three primary reasons for establishing population objectives at Tule Lake and Lower Klamath Refuges. First, is to match habitats with desired waterfowl numbers; second, is to provide habitats in coordination with other Flyway-wide habitat and population objectives; and third, is as a communication tool so that the public understands the basis for refuge habitat management programs. In establishing population objectives, there are many factors that influence waterfowl use of an area, many of which are outside the control of refuge managers and biologists. For example, drought in northern breeding areas may reduce continental populations. Year-specific weather patterns may mean an earlier or later migration or cause waterfowl to shift migration and wintering areas. Landscape conditions in other areas of the flyway, may influence populations at migration staging or wintering areas. Many of these variables cannot be anticipated or influenced. Thus, it is not necessarily reasonable to expect to achieve exact specified population objectives every year.

At the individual refuge scale, matching habitats to population objectives is also desirable from an operational efficiency standpoint. If waterfowl objectives can be met with, for example, 70% of the refuge's land area, then the other 30% could be used to meet the broader refuge purpose of "wildlife conservation" under the Kuchel Act. At a Flyway scale, Tule Lake and Lower Klamath Refuges are primarily migration habitat and should be providing sufficient foods and habitats to sustain desired Pacific Flyway populations as the birds migrate either south to wintering areas or north in spring to breeding areas.

The NAWMP update (2012) recommends that joint ventures, including the IMWJV, step down continental waterfowl population objectives to joint venture objectives. The IMWJV has begun this process with population objectives for key migration staging areas, which includes the SONEC region of which the Klamath Basin is a key part. Population objectives for Tule Lake and Lower Klamath Refuges represent a portion of the total objectives for the larger SONEC region. Waterfowl population objectives developed for Lower Klamath Refuge (Table 1) and Tule Lake Refuge (Table 2) are consistent with objectives of the NAWMP as well as planning efforts within the Intermountain West and the Pacific Flyway.

Population objectives for breeding waterfowl (Tables 3 and 4) parallel objectives for migratory waterfowl in that the decade of the 1970s are used to establish continental and flyway population objectives. For comparison purposes, the table below depicts breeding waterfowl numbers during various time periods beginning in 1953. Under this objective, the Service will strive to provide habitat sufficient to support objective numbers of breeding waterfowl. Habitat objectives for seasonal and permanent wetlands at Lower Klamath and Tule Lake Refuges are expected to provide sufficient habitat to achieve breeding waterfowl objectives.

Marshes of the Upper Klamath Basin are important molting habitat for thousands of Pacific Flyway waterfowl with mallard and gadwall being the most numerous species. Habitat for molting waterfowl

(particularly mallards breeding further south in California, see Yarris et al. (1994)) is an important function of Refuge. An aerial survey conducted on 26 July 2003 estimated a molting population of 90,100 mallards and 15,050 gadwall on Lower Klamath Refuge and 95,000 mallards and 70,200 gadwall on Tule Lake Refuge. Unfortunately, this appears to be the only survey of molting waterfowl conducted. Population objectives for molting mallards could be achieved either through an extended period of survey work (5 years) or by assigning an objective based on a portion of the estimated breeding population of mallards in California. Over the last 20+ years, the California Department of Fish and Wildlife has conducted statewide waterfowl breeding population surveys each spring. It is expected that providing permanent wetlands to support migrating diving ducks and swan objectives will also provide sufficient summer habitat for molting waterfowl.

It is important to note that providing these habitats will not guarantee that the desired abundance of waterfowl will appear. There are many factors that influence waterfowl abundance in the Pacific Flyway such as habitat conditions elsewhere in the Flyway, breeding success in the north, and climatic conditions. However, not providing sufficient foods for target populations will insure that the Refuge cannot support these population objectives.

Table 1. Migratory waterfowl population objectives for Lower Klamath National Wildlife Refuge, September 1 to April 15. Objectives are 75th percentile counts from aerial surveys conducted during a 10-year period. Table from Dugger et al. (2008).

| Waterfowl Taxa or Guild ^a | | | | | |
|--------------------------------------|-----------------------|---------------------|--------------------|--------|--------|
| Date | Dabblers ^b | Divers ^c | Geese ^d | Swans | Coots |
| Sept 1 | 213,521 | 2,270 | 7,640 | 0 | 28,000 |
| Sept 15 | 219,869 | 1,791 | 5,820 | 0 | 33,250 |
| Oct 1 | 401,738 | 3,708 | 51,610 | 0 | 52,863 |
| Oct 15 | 597,010 | 7,385 | 36,095 | 0 | 59,925 |
| Nov 1 | 597,536 | 6,313 | 34,160 | 1,545 | 23,625 |
| Nov 15 | 487,361 | 5,783 | 46,855 | 3,193 | 15,925 |
| Dec 1 | 372,560 | 1,250 | 19,475 | 930 | 19,500 |
| Dec 15 | 198,118 | 855 | 12,488 | 1,398 | 5,500 |
| Jan 1 | 10,594 | 160 | 7,430 | 2,490 | 540 |
| Jan 15 | 27,171 | 305 | 12,990 | 7,211 | 550 |
| Feb 1 | 77,714 | 800 | 11,431 | 14,043 | 1,750 |
| Feb 15 | 223,459 | 2,175 | 56,580 | 14,960 | 8,350 |
| Mar 1 | 148,414 | 1,560 | 66,248 | 18,995 | 4,850 |
| Mar 15 | 203,306 | 1,600 | 80,433 | 3,186 | 11,000 |
| Apr 1 | 96,775 | 3,600 | 49,880 | 0 | 45,000 |
| Apr 15 | 83,339 | 2,020 | 70,185 | 0 | 16,475 |

^aSpecies combined into guilds based on foraging method and diet. Means calculated for either 1970-1979 (ducks) or 1990-1999 (geese and swans) [Appendix N]

^bDabblers include Mallard, Gadwall, Northern Pintail, Green-winged Teal, Cinnamon Teal, and Northern Shoveler

^cDivers include Canvasback, Redhead, Ruddy Duck, Bufflehead, Ring-necked Duck, Goldeneye, and Scaup

^dGeese include Canada Goose, Cackling Goose, Greater White-fronted Goose, Lesser Snow Goose, Ross's Goose

Table 2. Waterfowl population objectives by date for Tule Lake National Wildlife Refuge. Objectives are 75th percentile counts from aerial surveys conducted during a 10-year period.

| Waterfowl Taxa or Guild ^a | | | | | |
|--------------------------------------|-----------------------|---------------------|--------------------|-------|---------------|
| Date | Dabblers ^b | Divers ^c | Geese ^d | Swans | American Coot |
| Sept 1 | 53,100 | 4,270 | 14,680 | 0 | 31,000 |
| Sept 15 | 54,725 | 2,990 | 10,630 | 0 | 82,575 |
| Oct 1 | 292,200 | 6,998 | 37,460 | 0 | 124,900 |
| Oct 15 | 281,100 | 10,730 | 82,170 | 0 | 115,200 |
| Nov 1 | 765,901 | 16,440 | 136,413 | 260 | 52,375 |
| Nov 15 | 268,328 | 11,088 | 146,605 | 713 | 35,925 |
| Dec 1 | 193,700 | 3,825 | 50,275 | 1,230 | 10,650 |
| Dec 15 | 262,400 | 2,200 | 64,608 | 1,125 | 8,000 |
| Jan 1 | 37,015 | 193 | 9,240 | 640 | 300 |
| Jan 15 | 91,955 | 675 | 4,040 | 4,205 | 800 |
| Feb 1 | 24,635 | 525 | 8,350 | 1,525 | 2,550 |
| Feb 15 | 42,850 | 3,115 | 13,935 | 1,530 | 5,300 |
| Mar 1 | 16,903 | 1,308 | 44,233 | 1,115 | 3,750 |
| Mar 15 | 63,486 | 3,388 | 112,708 | 8 | 12,375 |
| Apr 1 | 92,620 | 2,555 | 35,705 | 50 | 14,500 |
| Apr 15 | 32,975 | 2,638 | 39,595 | 0 | 10,250 |

^aSpecies combined into guilds based on foraging method and diet. Seventy-fifth percentiles calculated for either 1970-1979 (ducks) or 1990-1999 (geese and swans) [Appendix N]

^bDabblers include Mallard, Gadwall, Northern Pintail, Green-winged Teal, Cinnamon Teal, and Northern Shoveler

^cDivers include Canvasback, Redhead, Ruddy Duck, Bufflehead, Ring-necked Duck, Goldeneye, and Scaup

^dGeese include Canada Goose, Cackling Goose, Greater White-fronted Goose, Lesser Snow Goose, Ross's Goose

| Table 3. Estimated mean number of breeding pairs of waterfowl on Lower Klamath Refuge for the 12 years prior to the Kuchel Act (1953-64) and the decade of the 1970s and 1990s. | | | |
|--|----------------|----------------|----------------|
| Species | 1953-64 | 1970-79 | 1990-99 |
| Redhead | 1,178 | 782 | 1,471 |
| Ruddy duck | 1,104 | 2,435 | 648 |
| Mallard | 1,054 | 1,534 | 2,454 |
| Gadwall | 1,770 | 1,672 | 11,321 |
| Cinnamon teal | 617 | 1,100 | 889 |

| Table 4. Estimated mean number of breeding pairs of waterfowl on Tule Lake Refuge for the 12 years prior to the Kuchel Act (1953-64) and the decade of the 1970s and 1990s. | | | |
|--|----------------|----------------|----------------|
| Species | 1953-64 | 1970-79 | 1990-99 |
| Redhead | 1,350 | 635 | 161 |
| Ruddy duck | 1,503 | 3,092 | 315 |
| Mallard | 1,795 | 2,186 | 2,072 |
| Gadwall | 494 | 1,128 | 1,256 |
| Cinnamon teal | 610 | 667 | 200 |

Non-Game Waterbirds

Objectives for non-game waterbird focal species (Table 5) are based on abundance estimates for non-game migratory and breeding waterbirds conducted by Shuford et al. (2006). Habitats to achieve species objectives are estimated based on habitats present during the above mentioned surveys. It's important to note that habitat acreage objectives for non-game waterbirds are not necessarily additive to acreage objectives for waterfowl. In most cases, habitats needed for waterfowl also serve much of the needs for non-game waterbirds as well. For example, agricultural habitats primarily serve the needs of spring and fall migratory waterfowl but are critical in fall as a foraging habitat for 1,000-1,500 greater sandhill cranes. The agricultural habitats needed to serve fall staging cranes is much less than that required by waterfowl; therefore, there is no agricultural objective for cranes.

Table 5. Non-game waterbird population objectives for Lower Klamath and Tule Lake Refuges.

| | | Population Objectives | |
|----------------------------|----------------------|------------------------------|-------------------------|
| Species Group/Guild | Focal Species | Lower Klamath Refuge | Tule Lake Refuge |
| Migrating Shorebirds | long-billed | 2,000 – spring | 700 – spring |
| | dowitchers | 10,000 - fall | 1,000 – fall |
| Breeding Shorebirds | black-necked stilts | 2,000 | |
| Marsh Nesting Colonial | white faced ibis | 1,500 breeding ibis | 1,500 breeding ibis |
| Waterbirds | eared grebes | 2,400 nests | 800 nests |
| Island Nesting Colonial | American white | 200 pairs | 200 pairs |
| Waterbirds | pelicans | | |
| Tree Nesting Colonial | great egrets | 200 pairs | n/a |
| Waterbirds | | | |
| Upland Nesting | long-billed curlew | 50 pairs | n/a |
| Shorebirds | | | |

Habitat Management Objectives

Because the Kuchel Act directs the Service to manage Lower Klamath and Tule Lake Refuges for the primary purpose of **waterfowl management**, this becomes the primary focus of the Refuge's habitat management program. Refuge managers and biologists will seek to provide a complex of habitats sufficient to support the population objectives of migrating, breeding, and molting waterfowl. A variety of habitat types are required to meet the needs for both migratory species and those species that remain during spring and summer to breed. Habitats include seasonal and permanent wetlands, agricultural lands, and uplands.

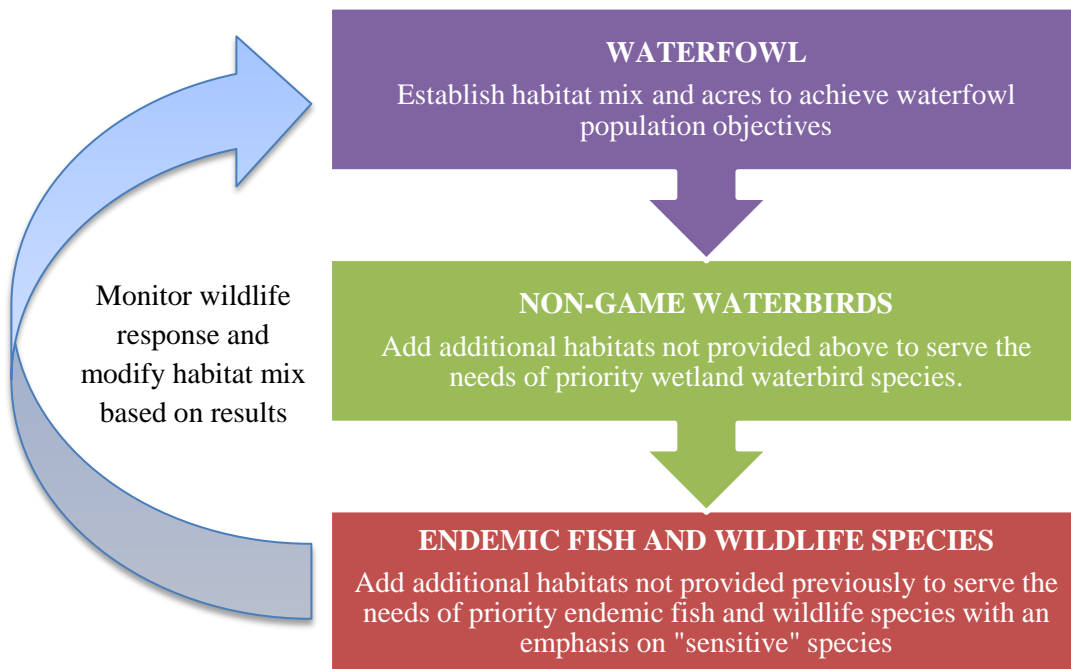
In order to provide sufficient foods to support waterfowl population objectives depicted in Tables 1 and 2, a specific acreage of each habitat type will be required. These estimates are based on cooperative studies conducted by Oregon State University, Ducks Unlimited and the Service, which were completed in the early 2000s (see Appendix N). The habitat objectives for Lower Klamath and Tule Lake are based on Model #3 and Model #8, respectively, in Appendix N. There is some flexibility in the proportion of habitats provided. For example, some species such as dabbling ducks (mallards, pintail, wigeon, etc.) forage in seasonal wetlands as well as grain fields. Thus, more seasonal marshes may mean less required grain crops; however, in this case, there is not necessarily an acre for acre comparison.

It is important to note that providing these habitats will not guarantee that the desired abundance of waterfowl will appear. There are many factors that influence waterfowl abundance in the Pacific Flyway such as habitat conditions elsewhere, breeding success in the north, and climatic conditions. However, not providing sufficient foods for target populations will ensure that the refuges cannot support these population objectives.

In addition to the Refuge's primary focus of waterfowl management, the Service has a legal mandate to provide for migratory birds. In the case of Lower Klamath and Tule Lake Refuges, **wetland oriented non-game migratory birds** are of primary importance. Similar to waterfowl, refuge managers and biologists will strive to provide a complex of wetland habitats sufficient to support objective numbers of priority non-game waterbird species during both the migratory and spring/summer breeding period. Priority species are selected to be representative of the habitat needs of other similar guilds of waterbird species.

The final focus of habitat management is to support a full range of **endemic fish and wildlife species with an emphasis on "sensitive" species**. This will allow the refuge to provide for the full range of endemic biological diversity that was historically present in the Lower Klamath Lake Basin. To achieve this, the Refuge will provide habitats to support endemic wildlife species with an emphasis on those species listed as Federal or State listed or are considered rare or declining in numbers.

The diagram below depicts the basic stepwise process of prioritizing habitat management among the above three focus areas. It is important to note there is considerable overlap between habitats between the three. For example, providing habitats for waterfowl will also achieve a large proportion of the habitat needs for non-game waterbirds and endemic fish and wildlife species. Table 6 below shows the habitat associations for each guild of waterfowl and non-game waterbirds.



| Table 6. Wetland and agricultural habitat associations for waterfowl and non-game waterbirds during different lifecycle events at Klamath Basin Refuge Complex ¹ . Lifecycle event abbreviations are: S-Spring Migration; N-Nesting; B-Brood Period; M-Molt ² ; F-Fall Migration. Habitat values in bold are relatively more important than other values for a given guild. Blank cells mean a habitat has no value for the guild. | | | | | | | | | | |
|--|-------------------------|------------------------|-----------------------|------------------|-------------|--------------------------------------|------------------------------|---------------------|-----------------------|-------------|
| Guild | Managed Wetlands | | | | | Cooperative and Lease Land Ag | | | | |
| | Permanent Wetland | Early Seasonal Wetland | Late Seasonal Wetland | Ephemeral Basins | Wet Meadows | Flood Fallow/Walking Wetlands | Pre-irrigated Standing Grain | Pre-irrigated Grain | Pre-irrigated Pasture | Other Crops |
| Dabbling ducks | SNBMF | SNBF | SNBMF | S | SNBF | SNBMF | SF | SF | SF | Potatoes |
| Diving ducks | SNBMF | SF | SF | SF | | SF | | | | |
| Geese | SNBMF | SNBF | SNBF | SF | SF | SF | SF | SF | SF | F |
| Swans | SF | SF | SF | SF | SF | SF | SF | SF | SF | |
| Cranes | SNBF | SNBF | SNBF | SBF | SBF | SF | SF | SF | SF | SF |
| Shorebirds | | SNF | SNF | SNF | SNF | SNF | SF | SF | SF | |
| Marsh nesting colonial waterbirds | SNBF | SNBF | SNBF | SNBF | SNBF | SNBF | SNBF | SNBF | SNBF | |
| Island nesting colonial waterbirds | SNBF | | SNBF | | | SNBF | | | | |
| Tree nesting colonial waterbirds | SNBF | SNBF | SNBF | SNBF | SNBF | SNBF | SNBF | SNBF | SNBF | |
| Upland nesting shorebirds | | SF | SF | SNBF | SNBF | SNBF | SF | SF | SF | |

¹ Not all habitats are present at each refuge.

² Only includes flightless molts

LOWER KLAMATH NATIONAL WILDLIFE REFUGE

Goal 1 – Provide wetland and agricultural habitats that meet food and cover requirements sufficient to support migratory waterfowl and non-game waterbird population objectives throughout the annual cycle while promoting the highest possible natural biological diversity of refuge habitats.

Overarching Objectives

Objective 1.1 – Water – Lower Klamath Refuge. Over the next 15 years, seek to secure and efficiently distribute water of sufficient quantity and quality to achieve habitat and population objectives.

Rationale – The hydrology of the Lower Klamath Refuge has been altered greatly by the effects of drainage and irrigation (Weddell 2000). Historically, the refuge was a large, shallow lake and wetland area that was flooded naturally with overflow from the Klamath River during the spring (Mayer 2005). Today, the refuge is disconnected from the river by a railroad bed that serves as a dike.

Lower Klamath Refuge receives most of its water from two sources: direct project diversions from the Klamath River through the Ady Canal, and project return flows from Tule Lake sumps via the D plant. Deliveries of direct project diversions through the Ady Canal to the refuge were fairly stable through the 1980s and 1990s. Historically the main water issue on Lower Klamath Refuge was limited drainage capacity and too much water rather than too little (Service 1960-1973). In the six drought years in the first half of the record, 1981-1997, the refuge received an average of 28,000 acre-feet of direct project diversions from the Ady Canal. Even after the federal ESA listings of the 1980s and 1990s put limitations on the availability of project water supply, in drought years 1992 and 1994, Lower Klamath Refuge still received 21,000 acre-feet and 42,000 acre-feet, respectively, of direct project diversions. The main effect of the federal ESA listings on the refuge water supply during drought years was on the D Plant return flows, which decreased substantially in 1992 and 1994.

Approximately 105,000 acre-feet of water is needed each year for Lower Klamath Refuge to fully meet wetland and agricultural habitat objectives (Objectives 1.5 – 1.8). However, recent drought years associated with limited project water availability have seen substantial reductions in Ady Canal deliveries to Lower Klamath Refuge, mainly due to unresolved questions about within-project priority. Compounding the water supply problems at the refuge is the fact that D Plant pumping of project return flows from Tule Lake Refuge to Lower Klamath Refuge also has declined significantly in recent years, following the expiration of a 50-year old contract in 2006 that supplied low cost power to the project irrigators (DOI and California Oregon Power Company 1956). In contrast to the 1980s and 1990s, in the six drought years in the last half of the record (1998-2015), the refuge has been nearly dry, only receiving an average of 13,000 acre-feet from the Ady Canal, as contrasted with refuge water needs and historical deliveries, of over 100,000 acre-feet annually. In 2014, there were zero Ady Canal deliveries to Lower Klamath Refuge and in 2015, 19,000 acre-feet (through November 2015).

Establishing reliable water and the ability to cost-effectively and efficiently deliver it throughout wetland units on Lower Klamath National Wildlife Refuge is paramount to the Service's ability to provide diverse wetlands, protect native habitats and wildlife diversity throughout the year, reduce populations of invasive plants, and respond to changing environmental and climatic conditions. Thus, as our highest priority for Lower Klamath National Wildlife Refuge, we will to continue to seek solutions for securing and delivering consistent water.

Monitoring Indicator: acre-feet of water delivered to the refuge

| Alternative | | | | Strategies |
|-------------|---|---|---|--|
| A | B | C | D | |
| X | X | X | X | Maintain 1905 irrigation right and Federal Reserved rights pursuant to 2013 Final Order and Determination (FOD). |
| X | X | X | X | Pursue exceptions to the FOD that would allow the use of irrigation water in seasonal wetlands, the flood fallow agricultural practice, and change the period of use for irrigation water to year round. |
| X | X | X | X | Maintain existing water delivery facilities. |
| X | X | X | X | Seek to improve water conservation and efficiencies to optimize existing water use. |
| X | X | X | X | Seek opportunities to offset increasing power and pumping rates. |
| X | X | X | X | Monitor water quality of delivered water supplies, pass through water, and spill water. |
| X | X | X | X | Identify water quality issues and employ BMPs and with the assistance of partners and other agencies. |
| | X | X | X | If KBRA or some comparable agreement is not implemented, pursue changes in the type, place of use, and period of use for Lower Klamath and Tule Lake water rights necessary to ensure sufficient water is available for refuge wetlands. |
| | X | X | X | Explore methods where refuge wetlands can contribute to water quality improvements in the Upper Klamath Basin. |
| | | | X | Water would be distributed to flood the southern 1/4 of Lower Klamath Refuge (up to 9,000 acres to a maximum of 7 feet; summer/fall evaporation would reduce this acreage by ½ if summer/fall water deliveries were unavailable.). |
| | | | X | Remove up to 31 water control structures within Big Pond footprint. |
| | | | X | Abandon/remove up to 29 miles of interior levees/roads within Big Pond footprint. |
| | | | X | Abandon interior drain fields within Big Pond footprint. |

Objective 1.2 – Managed Habitat Complex – Lower Klamath Refuge. Over the next 15 years, provide the proper mix and juxtaposition of habitats to provide for waterfowl and focal nongame waterbird species.

Rationale – A mix of habitats is desirable for several reasons. Habitat complexes tend to be complementary, with the strength of one habitat compensating for weakness in another. For example, while agricultural habitats can provide the greatest energy per acre, wildlife diversity is low. In contrast, food energy densities are lower in wetlands but the diversity of foods provided and number of wildlife species is greater (Reinecke et al 1989). “Various types of wetlands are required to match the seasonal needs of waterfowl and, for optimal production, the appropriate types must be included on those public and private landscapes managed for waterfowl” (Bolen 2000). Because agricultural foods contain insufficient protein and/or a full complement of required amino acids (Baldassarre et al. 1983), and support a relatively limited assemblage of waterfowl species, experts believe that agricultural crops should be limited to the minimum necessary to satisfy food production objectives that cannot be provided from more “natural” foods (Reinecke et al. 1989).

Using waterfowl population objectives in concert with food resources provided by different refuge habitats allows refuge managers and biologists to estimate the quantity and type of habitats needed to support population objectives. Thus, population objectives become thresholds toward which direct habitat management (quantity, quality, diversity, seasonality, location, etc.) is targeted. Inventory and monitoring of populations are then used to evaluate actual waterfowl populations and habitat use as part of an adaptive management process.

In addition to the year-specific matrix of habitats, there is a rotational component to the program. In

many areas, wetlands and croplands are rotated as a means of managing vegetative succession in wetlands, and year-round wetlands are periodically dewatered to enhance their productivity. There is some flexibility in the proportion of habitats provided. For example, some species such as dabbling ducks (mallards, pintail, wigeon, etc.) forage in seasonal wetlands as well as grain fields. Thus, more seasonal marshes may mean less required grain crops; however, in this case, there is not necessarily an acre for acre comparison.

Monitoring Indicator: vegetation mapping

| Alternative | | | | Strategies |
|-------------|---|---|---|--|
| A | B | C | D | |
| X | X | X | X | Develop annual habitat management plans that prioritize habitat enhancement and restoration needs as well as the maintenance of the water management system. |
| X | X | X | X | Set annual habitat objectives each spring based on water delivery projections and acreage of permanent wetlands carried over from the previous year. |
| X | X | X | X | Rotate wetlands and agricultural lands to setback the gradual increase in emergent vegetation that occurs with normal successional processes in wetlands. This rotation among several management units over time allows for a gradation of successional stages (diversity) among wetlands and provides small grains used by waterfowl and sandhill cranes. |
| X | X | X | X | Monitor waterfowl populations to determine if population objectives are achieved. |
| | X | X | X | Base habitat objectives on providing sufficient habitat to support the 75th percentile of 1970s duck and 1990s goose populations (Appendix M). |
| | X | X | X | Develop a habitat management plan that includes SMART objectives for each refuge habitat, monitoring programs that track achievement of both population and habitat objectives, and thresholds for taking management actions. |
| | X | X | X | Maintain wetland production throughout the year – use habitat bioenergetics model to efficiently use water to produce highest quality matrix of wetland and upland habitat for migratory birds. |
| | X | X | X | Periodically monitor foraging values to ensure assumptions about food availability remain accurate. |
| | X | X | X | Monitor changes in the environment, such as vegetation communities, wildlife trends, and surface and groundwater levels, to assess the effects of climate change on the Refuge. |
| | X | X | X | Update the Inventory and Monitoring Plan. |

Objective 1.3 – Sustainable agricultural practices – Lower Klamath Refuge. Over the next 15 years, promote sustainable agricultural practices on lease land and cooperatively farmed units, consistent with principles of waterfowl management and energetic needs of waterfowl.

Rationale – In terms of the Refuge’s agricultural lands (leased and cooperative farm lands), proper waterfowl management is defined as: providing sufficient agricultural foods to sustain waterfowl population objectives for fall and spring migrant geese and dabbling ducks (mallard and pintails primarily) as well as providing sufficient foods to alleviate depredation of crops on private lands. Refuge agricultural programs should be managed synergistically with other refuge habitats such that the overall refuge habitat program provides the diversity of habitats and food resources required. Proper waterfowl management in this context also means that post-harvest practices increase the attractiveness of fields to migratory waterfowl and that waterfowl can reach these fields with minimal energetic costs.

Monitoring Indicator: acres of grain and pasture; fall sandhill crane staging survey, fall staging waterbird survey, periodic waterfowl surveys

| Alternative | | | | Strategies |
|-------------|---|---|---|--|
| A | B | C | D | |
| X | X | X | X | Provide agricultural habitats through the issuance of cooperative farming and lease land contracts with local farmers, consistent with provisions of the Kuchel Act. |
| X | X | X | X | Maintain fall pre-irrigation on fields in Area-K. |
| X | X | X | X | Use flood fallow agricultural practice to control invasive plant species such as perennial pepperweed, quackgrass, mustard, and <i>Bassia</i> sp. To control those species, farmed fields may be subjected to permanent flooding for a period of 18 months every 5 to 8 years. |
| X | X | X | X | Evaluate and permit chemical applications according to USFWS and DOI policies, Refuge Integrated Pest Management Plan, and Pesticide Use Proposals. |
| | X | X | X | Leverage more wetland habitat on private lands in the basin by expanding the use of preferential permits for cooperatively farmed grain and hay units for farmers that participate in the Walking Wetlands program on their private lands. |
| | X | X | X | Periodically evaluate the leasing program to ensure that sufficient agricultural foods are available to support spring and fall population objectives for geese and dabbling ducks. |
| | X | X | X | Require annual SUPs for Reclamation with stipulations and prescribed habitat mix based on the energetics modeling. |
| | X | X | X | Require annual SUPs for commercial contractors (i.e., fertilizer, pesticide applications). |
| | X | X | X | Require stipulations and all other specific requirements from the SUPs be included as part of lease contracts. |
| | | X | X | Expand area of lease land and cooperatively farmed units that are managed organically. |
| | | X | X | Expand incentives such as lease extensions for farmers that manage fields organically. |
| | | X | X | Use flood fallow agricultural practice on fields with expiring contracts if needed to achieve habitat objectives. |

Objective 1.4 – Disease Prevention – Lower Klamath Refuge. Over the next 15 years, continue to minimize the occurrence, spread, and severity of avian cholera and botulism outbreaks.

Rationale – Since the 1940s when 100,000 birds died of botulism, waterfowl disease problems have occurred almost annually on Tule Lake and Lower Klamath Refuges; avian cholera and botulism type C cause the greatest mortality. Avian cholera was first recorded in 1955 and some winters have claimed up to 20,000 birds. Other chronic disease problems that occur each year but are not contagious and cause less mortality include lead poisoning, aspergillosis, and tuberculosis. Disease data is collected by management unit. Ultimately, this information is used to determine if particular management activities precipitate disease outbreaks or if certain geographical areas are prone to disease.

Monitoring Indicator: number of bird deaths due to avian cholera, botulism, and other diseases

| Alternative | | | | Strategies |
|-------------|---|---|---|--|
| A | B | C | D | |
| X | X | X | X | Implement the wildlife disease management plan. |
| X | X | X | X | Patrol wetland areas that have been historically associated with botulism on the Refuge in order to quickly detect and respond to outbreaks. |
| X | X | X | X | Remove sick and dead birds from wetlands. |

Objective 1.5 – Sanctuary. Over the next 15 years, continue to provide 60% of the Lower Klamath Refuge’s land base as sanctuary to provide high quality resting, foraging, and nesting habitat for waterfowl and other wildlife.

Rationale – Sanctuaries are areas on the Refuge that are closed to public use. They provide places where human-caused disturbances are reduced, thereby reducing the interruption of wildlife activities, such as foraging, resting, breeding, feeding nestlings, and other maintenance activities. Sanctuaries are especially important during high visitor use periods. They are also important for wildlife to avoid predation by other wild animals, as they can devote less energy to avoiding humans and more to avoiding predators.

In some cases, short-term sanctuaries may be established on the Refuge to protect a sensitive nesting colony or site. These seasonal sanctuaries may impose public access restrictions at some nesting sites for species with a low tolerance for human disturbance.

Monitoring Indicator: see indicators for habitat objectives

| Alternative | | | | Strategies |
|-------------|---|---|---|---|
| A | B | C | D | |
| X | X | X | X | Provide 60% of the Lower Klamath Refuge land base as disturbance free sanctuary area. |
| X | X | X | X | Protect all colonial nesting waterbird breeding sites from disturbance. |
| X | X | X | X | Protect the quarry from disturbance during the bank-swallow breeding season. |

Objective 1.6 – Seasonal Wetlands – Lower Klamath Refuge. Over the next 15 years, at least 16,114 acres of seasonal wetlands occur at Lower Klamath Refuge on an annual basis and include a mosaic of 30% early successional and 70% late successional wetlands flooded beginning Sep-Nov. In addition, 15% of the total acreage of seasonal wetland will consist of ephemeral seasonal wetland flooded <10 cm deep with 20-50% cover of short emergent vegetation.

Rationale – Seasonal wetlands were likely a significant proportion of the original Lower Klamath Lake and are critical to meeting the migratory waterfowl needs within the Refuge as well as the Pacific Flyway (see Fleskes and Battaglia 2004). In addition, this habitat provides brood areas for early nesting waterfowl species such as mallards (Mauser et al. 1994) and pintails and is extensively used by spring migrant shorebirds and other wildlife species.

In concert with the other habitat objectives, the seasonal wetland seeks to provide sufficient foods to support waterfowl populations depicted in Table 1. Habitat acreage needs are based on cooperative studies conducted by Oregon State University, Ducks Unlimited and the Service, which were completed in the early 2000s (see Appendix N). There is some flexibility in the proportion of habitats provided. For example, some species such as dabbling ducks (mallards, pintail, wigeon, etc.) forage in seasonal wetlands as well as grain fields. Thus, more seasonal marshes may mean less required grain crops; however, in this case, there is not necessarily an acre for acre comparison.

It is important to note that providing these habitats will not guarantee that the desired abundance of waterfowl will appear. There are many factors that influence waterfowl abundance in the Pacific Flyway such as habitat conditions elsewhere, breeding success in the north, and climatic conditions. However, not providing sufficient foods for target populations will insure that the Refuge cannot support these population objectives.

In addition to supporting waterfowl population objectives, the seasonal wetland objective seeks to provide sufficient habitat to provide for a migratory population of 2,000 long-billed dowitchers in spring (May) and 10,000 long-billed dowitchers during fall migration (July-August). It is important to note that these target populations are single point-in-time numbers. It is probable that that much higher numbers will actually use the refuge during migration as shorebirds on continually arriving as other move north or

south in the Flyway. The long-billed dowitcher was selected as the priority species as it represents the habitats also needed by least and western sandpipers as well as a host of other fall and spring migrating shorebirds. In addition, the long-billed dowitcher is considered a priority 2 species in the Intermountain West Joint Venture Regional Shorebird Plan. It is estimated that 1,600 acres of early spring seasonal marsh and 3,000 acres of ephemeral seasonal marsh will be required to achieve the spring and fall population targets, respectively.

This objective seeks to provide 3,000 acres of ephemeral seasonal wetland (flooded Dec-Aug) to support a target population of 2,000 breeding black-necked stilts. This particular habitat should be comprised of shallow (<10 cm) water with approximately 20-50% short stature emergent vegetation.

Monitoring Indicators: vegetation mapping, breeding Canada goose pairs survey, breeding duck pairs survey, breeding sandhill crane survey, colonial waterbird surveys, fall sandhill crane staging survey, fall staging waterbird survey, mid-winter waterfowl survey, nongame waterbird breeding population survey, periodic waterfowl surveys, secretive marshbird surveys, spring shorebird survey, tule goose fall survey, wintering raptor surveys, wintering tule goose survey

| Alternative | | | | Strategies |
|-------------|---|---|---|--|
| A | B | C | D | |
| X | X | X | X | Use disking, plowing, prescribed burning and rotation through grain in seasonal wetland units to set back vegetative succession and improve habitat conditions for waterfowl. |
| X | X | X | X | Manage water levels in management units to enhance wetlands for specific guilds of waterfowl and other nongame waterbird species. For example, lowering of water levels in wetland management units during migration can greatly increase use by shorebirds and waterfowl by exposing aquatic invertebrate food resources. |
| X | X | X | X | Continue to scout, map, and control priority weed species with an emphasis on protecting high priority wildlife habitats. |
| | X | X | X | Formalize ongoing pest management activities under an IPM program. |
| | X | X | X | Develop program for managing berms to reduce invasive species cover and improve cover for nesting waterfowl and other species. |
| | X | X | X | Use GPS to monitor weed populations. |
| | X | X | X | Expand use of non-pesticide tools to control invasive species (e.g., grazing, restoration plantings). |
| | | X | X | Prevent the introduction of aquatic invasive species by pursuing partnerships with the states of California and Oregon to develop and operate a portable decontamination station(s) near boat launches on the Refuge. |
| | | | X | Convert managed wetland units 10B, 11A1, 11A2, 11B, 11C, 12A, 12B, 12C, 13A, and 13B to a "Big Pond" unit. |

Objective 1.7 – Permanent Wetlands – Lower Klamath Refuge. Over the next 15 years, at least 9,294 acres of permanent wetlands occur at Lower Klamath Refuge on an annual basis and include a mosaic of 20% emergent wetlands and 80% submergent wetlands. Emergent wetlands are characterized by tall emergent vegetation, including hardstem bulrush and cattail coverage ranging from 20-70% cover. Submergent wetlands are dominated by sago pondweed with lesser amounts of baby pondweed (*P. pusillus*) and coontail (*Ceratophyllum demersum*). Water depths in both wetlands range from 6 inches to 3 feet deep.

Rationale – This habitat emulates the permanently flooded emergent wetlands which typified much of the historic Lower Klamath Lake. Permanent wetlands are flooded year-round and are crucial to meeting the refuge objectives for breeding and migrating waterfowl. An additional use of permanently flooded

wetlands is by molting waterfowl (July-September). Because these birds are flightless during this period, food, water, and cover must be in close proximity. Large permanently flooded marshes on Lower Klamath are heavily utilized for this purpose. Ducks have been documented to travel over 300 miles from their nesting areas to these marshes to molt (Yarris et al. 1994).

Permanent wetland units are characterized by two major plant communities: emergent and submergent wetlands. The emergent community is composed of hardstem bulrush and cattail with minor inclusions of river bulrush (*Scirpus fluviatilis*). The emergent vegetation provides nesting substrate for many species of waterfowl, wading birds, and passerine birds and acts as cover for resting waterfowl during periods of inclement weather. The submergent plant community is dominated by sago pondweed with lesser amounts of baby pondweed (*P. pusillus*) and coontail (*Ceratophyllum demersum*). This community is found in open water zones where water depths range from 6 inches to 3 feet. Sago pondweed is a major food source to migrating canvasbacks which feed almost exclusively on sago tubers during their 3 month stay in the fall. Other species of waterfowl such as the redhead, American wigeon, lesser scaup, mallard, American coot (*Fulica americana*), and tundra swan consume the vegetative parts and seeds of this as well as other submergent plants. The submergent plant community also supports a diverse and productive invertebrate community. These are sought by many species of migratory waterfowl and other marsh birds. During the summer months, invertebrates are a high protein food which meets requirements of breeding and molting waterfowl, grebes, and most ducklings. Breeding eared and western grebes as well as coots utilize vegetative parts of submergent plants to construct their nests.

In concert with the other habitat objectives, the permanent wetland habitat objective for Lower Klamath Refuge seeks to provide sufficient foods to support waterfowl populations depicted in Tables 1 and 3. Habitat acreage needs are based on cooperative studies conducted by Oregon State University, Ducks Unlimited and the Service, which were completed in the early 2000s (see Appendix N). It is important to note that providing these habitats will not guarantee that the desired abundance of waterfowl will appear. There are many factors that influence waterfowl abundance in the Pacific Flyway such as habitat conditions elsewhere, breeding success in the north, and climatic conditions. However, not providing sufficient foods for target populations will insure that the Refuge cannot support these population objectives.

Permanent wetlands should also support a target population of 1,500 breeding white faced ibis and 2,400 breeding eared grebes. These two species were selected to represent a host of other summer breeding marsh birds including black-crowned night herons, great and snowy egrets, Forester's terns, and Franklin's gull. The eared grebe was selected as an umbrella species as Lower Klamath and Tule Lake Refuges represent the only breeding locations in California and its preferred open water breeding habitat is used by several phalarope species and diving ducks. Colonial nesting species such as white pelicans, double-crested cormorants, and great blue herons (*Ardea herodias*) utilize permanent wetland units for nesting. These units provide secure and remote sites required for nesting, and provide an abundant supply of fish, the primary food item for these birds.

The western pond turtle (*Clemmys marmorata*) is frequently sighted in Unit 2, a permanently flooded wetland. In addition, approximate 5 acres of permanent wetlands are maintained as rearing habitat for juvenile shortnose and Lost River sucker. Both of these species are listed by the State and Federal governments as endangered species.

Monitoring Indicators: vegetation mapping, breeding Canada goose pairs survey, breeding duck pairs survey, breeding sandhill crane survey, colonial waterbird surveys, fall sandhill crane staging survey, fall staging waterbird survey, mid-winter waterfowl survey, nongame waterbird breeding population survey, periodic waterfowl surveys, secretive marshbird surveys, tule goose fall survey, wintering raptor surveys, wintering tule goose survey

| Alternative | | | | Strategies |
|-------------|---|---|---|--|
| A | B | C | D | |
| X | X | X | X | Use disking, plowing, prescribed burning and rotation through grain in permanent wetland units to set back vegetative succession and improve habitat conditions for waterfowl. |
| X | X | X | X | Manage water levels in management units to enhance wetlands for specific guilds of waterfowl and other nongame waterbird species. For example, lowering of water levels in wetland management units during migration can greatly increase use by shorebirds and waterfowl by exposing aquatic invertebrate food resources. |
| X | X | X | X | Maintain sufficient water in Sheepy Lake to provide habitat for the western pond turtle. |
| X | X | X | X | Maintain 5 acres of rearing habitat in both Fran's and the Austin pond for shortnose and Lost River sucker. |
| X | X | X | X | Continue to scout, map, and control priority weed species with an emphasis on protecting high priority wildlife habitats. |
| | X | X | X | Formalize ongoing pest management activities under an IPM program. |
| | X | X | X | Develop program for managing berms to reduce invasive species cover and improve cover for nesting waterfowl and other species. |
| | X | X | X | Use GPS to monitor weed populations. |
| | X | X | X | Expand use of non-pesticide tools to control invasive species (e.g., grazing, restoration plantings). |
| | | X | X | Prevent the introduction of aquatic invasive species by pursuing partnerships with the states of California and Oregon to develop and operate a portable decontamination station(s) near boat launches on the Refuge. |
| | | | X | Convert managed wetland units 10B, 11A1, 11A2, 11B, 11C, 12A, 12B, 12C, 13A, and 13B to a "Big Pond" unit. |
| | | | X | Remove up to 31 water control structures within Big Pond footprint. |
| | | | X | Abandon/remove up to 28.6 miles of interior levees/roads. |
| | | | X | Abandon 100 miles of interior drain fields. |

Objective 1.8 – Irrigated Pasture/Hay – Lower Klamath Refuge. Over the next 15 years, approximately 4,000 acres of low stature grasses and forbs occur at Lower Klamath Refuge on an annual basis.

Rationale – Waterfowl use several basic food types, including aquatic and terrestrial invertebrates, seeds, agricultural foods, and other plant parts. Each food type provides different benefits depending on nutritional value, species of waterfowl, and requirements during the annual life cycle. During spring, some waterfowl species such as geese, have adapted their feeding behavior to the availability of irrigated pasture and hay fields. Agricultural foods are now a primary constituent of foods available in many of the major waterfowl wintering and migration areas of North America. The high energy value of agricultural crops complements the more nutritionally balanced but lower energy content of foods available in refuge wetlands. Taken together, this balance of "natural" and agricultural foods supports hundreds of thousands of waterfowl and other waterbirds each year.

Refuge pasture and hay fields attract large populations of spring migrant geese which alleviate potential damage to private farmlands off the refuge. During the spring waterfowl migration these areas are heavily used by white-fronted, cackling, and Ross's geese. Long-billed curlews and willets use these areas for nesting in late spring and white-faced ibis use pasture/hay areas extensively when under summer irrigation.

| Monitoring Indicators: vegetation mapping, fall sandhill crane staging survey, fall staging waterbird survey, mid-winter waterfowl survey, periodic waterfowl surveys, spring shorebird survey, tule goose fall survey, wintering raptor surveys, wintering tule goose survey | | | | |
|--|---|---|---|--|
| Alternative | | | | Strategies |
| A | B | C | D | |
| X | X | X | X | Maintain fall flooding (pre-irrigation) in Area-K. |
| | X | X | X | To support dabbling duck and geese population objectives during winter and spring, convert an additional 1,300 acres of unharvested grain to irrigated pasture/green browse (subject to water availability). |
| X | X | X | X | Continue to scout, map, and control priority weed species with an emphasis on protecting high priority wildlife habitats. |
| | X | X | X | Periodically monitor foraging values to ensure assumptions about food availability remain accurate. |
| | X | X | X | Formalize ongoing pest management activities under an IPM program. |
| | X | X | X | Develop program for managing berms to reduce invasive species cover and improve cover for nesting waterfowl and other species. |
| | X | X | X | Use GPS to monitor weed populations. |

Objective 1.9 – Small Grains – Lower Klamath Refuge. Over the next 15 years, approximately 4,000 acres of harvested and 1,500 acres of unharvested small grains occur at Lower Klamath Refuge on an annual basis. All fields will be flooded post-harvest to increase the attractiveness of the fields for foraging waterfowl.

Rationale – Waterfowl use several basic food types, including aquatic and terrestrial invertebrates, seeds, agricultural foods, and other plant parts. Each food type provides different benefits depending on nutritional value, species of waterfowl, and requirements during the annual life cycle. During fall and winter, many waterfowl species, and especially geese, have adapted their feeding behavior to the availability of cereal grains (Baldassarre and Bolen 2006), using these foods when the need for carbohydrates is high. Agricultural foods are now a primary constituent of foods available in many of the major waterfowl wintering and migration areas of North America. The high energy value of agricultural crops complements the more nutritionally balanced but lower energy content of foods available in refuge wetlands. Taken together, this balance of “natural” and agricultural foods supports hundreds of thousands of waterfowl and other waterbirds each year.

In concert with the other habitat objectives, the small grain habitat objective for Lower Klamath Refuge seeks to provide sufficient foods to support waterfowl populations depicted in Tables 1 and 3. Habitat acreage needs are based on cooperative studies conducted by Oregon State University, Ducks Unlimited and the Service, which were completed in the early 2000s (see Appendix N). There is some flexibility in the proportion of habitats provided. For example, some species such as dabbling ducks and geese forage in grain as well as seasonal wetlands. Thus, more seasonal wetlands may mean less required grain; however, in this case, there is not necessarily an acre for acre comparison. It is important to note that providing these habitats will not guarantee that the desired abundance of waterfowl will appear. There are many factors that influence waterfowl abundance in the Pacific Flyway such as habitat conditions elsewhere, breeding success in the north, and climatic conditions. However, not providing sufficient foods for target populations will insure that the Refuge cannot support these population objectives.

When flood irrigated, grain fields are extremely attractive to fall migrant and wintering waterfowl. Grain grown on the refuge is consumed primarily by mallards and pintails (dabbling ducks), as well as geese, swans, and sandhill cranes and provide an important food resource for these birds during migration. Standing grains provide a rich source of carbohydrates and provides more food (kcal/acre) for less water

than wetland plants, which is particularly important for migrating dabbling ducks and geese. This high source of carbohydrates is considered an integral part of achieving waterfowl objectives. In addition, the practice of fall flooding grain fields has the added benefit of driving mice and voles from burrows which attracts large numbers of wintering raptors, with bald eagles being the most conspicuous.

Monitoring Indicators: vegetation mapping, fall sandhill crane staging survey, fall staging waterbird survey, mid-winter waterfowl survey, periodic waterfowl surveys, spring shorebird survey, tule goose fall survey, wintering raptor surveys, wintering tule goose survey

| Alternative | | | | Strategies |
|-------------|---|---|---|--|
| A | B | C | D | |
| X | X | X | X | Maintain fall flooding (pre-irrigation) in Area-K. |
| X | X | X | X | At least 25% of cooperatively farmed unharvested grains are left standing for wildlife benefit. |
| | X | X | X | Periodically monitor foraging values to ensure assumptions about food availability remain accurate. |
| | X | X | X | To support dabbling duck and geese population objectives during winter and spring, increase unharvested grain by approximately 500 acres. |
| | | X | X | Structure lease land contracts so that if habitat objectives for unharvested standing grain cannot be met on cooperatively farmed units, lease land contract holders would be required to leave 25% of their fields as unharvested standing grain. |
| X | X | X | X | Continue to scout, map, and control priority weed species with an emphasis on protecting high priority wildlife habitats. |
| | X | X | X | Formalize ongoing pest management activities under an IPM program. |
| | X | X | X | Develop program for managing berms to reduce invasive species cover and improve cover for nesting waterfowl and other species. |
| | X | X | X | Use GPS to monitor weed populations. |
| | X | X | X | Expand use of non-pesticide tools to control invasive species (e.g., grazing, restoration plantings). |

Objective 1.10 – Nesting Islands – Lower Klamath Refuge. Over the next 15 years, continue to provide 2 acres of island nesting habitat during the nesting season to support colonial nesting waterbirds such as American white pelican.

Rationale – Undisturbed islands for colonial nesting waterbirds are relatively uncommon in the Intermountain West and were a major habitat utilized by breeding waterbirds in historic Lower Klamath Lake. Currently, three islands exist on Lower Klamath Refuge, two of which were artificially constructed. This objective seeks to provide two acres of island habitat which should support a target population of 200 breeding pairs of American white pelicans. White pelicans were selected as the priority species as there are only 2-3 breeding sites in California, the species is considered of high concern in the Intermountain West Waterbird Conservation Plan, and is relatively sensitive to disturbance during the nesting season. Other species benefiting from this habitat include Caspian terns, double crested cormorants, and ring-billed and California gulls.

Monitoring Indicators: colonial waterbird surveys

| Alternative | | | | Strategies |
|-------------|---|---|---|--|
| A | B | C | D | |
| X | X | X | X | Develop annual habitat management plans that prioritize habitat enhancement and restoration needs as well as the maintenance of the water management system. |
| X | X | X | X | During the nesting season, minimize disturbance within ½ mile of nesting colonies. |

| | | | | |
|---|---|---|---|---|
| X | X | X | X | Continue to scout, map, and control priority weed species with an emphasis on protecting high priority wildlife habitats. |
| | X | X | X | Formalize ongoing pest management activities under an IPM program. |
| | X | X | X | Use GPS to monitor weed populations. |
| | X | X | X | Expand use of non-pesticide tools to control invasive species (e.g., grazing, restoration plantings). |

Objective 1.11 – Wet Meadows – Lower Klamath Refuge. Over the next 15 years, 3,000 acres of wet meadow habitat occur at Lower Klamath Refuge on an annual basis. The wet meadow will be flooded by natural runoff from February to April and grass heights will average < 4 inches during the nesting season.

Rationale – This habitat is primarily provided in Sheepy West and Fairchild Island units. The target acreage is 3,000 acres flooded by natural runoff from February to April. This habitat acreage should be sufficient to provide nesting habitat for up to 50 pairs of long-billed curlew. This species is considered a high priority species within the Intermountain West Regional Shorebird Plan and is representative of other short stature nesting species such as the willet.

Monitoring Indicators: vegetation mapping, breeding sandhill crane survey, fall sandhill crane staging survey, fall staging waterbird survey, mid-winter waterfowl survey, nongame waterbird breeding population survey, periodic waterfowl surveys, secretive marshbird surveys, spring shorebird survey, tule goose fall survey, wintering raptor surveys, wintering tule goose survey

| Alternative | | | | Strategies |
|-------------|---|---|---|--|
| A | B | C | D | |
| X | X | X | X | Use grazing, mowing/haying, or prescribed fire (prior to nesting) to achieve desired grass heights. |
| X | X | X | X | Continue to scout, map, and control priority weed species with an emphasis on protecting high priority wildlife habitats. |
| | X | X | X | Formalize ongoing pest management activities under an IPM program. |
| | X | X | X | Develop program for managing berms to reduce invasive species cover and improve cover for nesting waterfowl and other species. |
| | X | X | X | Use GPS to monitor weed populations. |
| | X | X | X | Expand use of non-pesticide tools to control invasive species (e.g., grazing, restoration plantings). |

Objective 1.12 – Uplands – Lower Klamath Refuge. Within 10 years, prepare a habitat management plan covering 6,500 acres of upland habitats on Lower Klamath Refuge.

Rationale – There are about 6,500 acres of uplands on Lower Klamath Refuge. Of that acreage, only 850 acres are capable of receiving irrigation. The remainder receives only precipitation. As a result, the vegetation is sparse and typical of the high desert. The irrigated area is maintained in mixed grass cover.

The unirrigated area is typically vegetated with shrubs and grasses. The overstory is composed of greasewood, gray rabbitbrush, and Great Basin wildrye. The understory is a mixture of grasses including cheat grass, foxtail barley, and Nevada bluegrass.

Unirrigated uplands offer cover for many species of birds and small mammals. It is used to some extent by waterfowl for nesting, but the primary nesting species are passerine birds and upland game. It is also a preferred location for coyote dens. Other common mammals include badgers, jackrabbits, cottontail rabbits, wood rats, and deer mice.

The 850 irrigated acres are vegetated with a mixture of “domesticated” grasses including brome grass,

meadow fescue, orchard grass, timothy, and tall wheatgrass. These grasses are burned in midwinter and irrigated in early April. They provide spring migrant sandhill cranes, snow geese, Ross's geese, cackling Canada geese, Great Basin Canada geese, and several species of ducks including mallard, pintail, and wigeon, with important spring forage.

Irrigated uplands provide spring migrant sandhill cranes, snow geese, Ross's geese, cackling Canada geese, Great Basin Canada geese, and several species of ducks including mallards, pintails, and wigeons with important spring forage. After the area dries in early April, several species of ducks, as well as long-billed curlews, willets, pheasants, short-eared owls, and northern harriers, use the area extensively for nesting. Some fields are traditionally among the highest density waterfowl nesting areas on the refuge.

Monitoring Indicators: vegetation mapping, breeding Canada goose pairs survey, breeding duck pairs survey, periodic waterfowl surveys, wintering raptor surveys

| Alternative | | | | Strategies |
|-------------|---|---|---|---|
| A | B | C | D | |
| X | X | X | X | Continue to use prescribed fire and grazing in the 6,500 acres of upland units to reduce cover of brush species, invigorate grass nesting cover for waterfowl and other ground nesting birds, and create green browse for spring migratory geese. |
| X | X | X | X | Selectively apply herbicides to reduce populations of noxious/exotic weeds such as perennial pepperweed. |
| | X | X | X | Develop a habitat management plan that includes SMART objectives, monitoring programs that track achievement of habitat objectives, and thresholds for taking management actions. |

Goal 2 – Support recovery and protection efforts for federally and state listed threatened and endangered species and sensitive species that occur within the Refuge.

Sensitive species are those that are listed as endangered or threatened by State or Federal agencies or are considered of conservation concern by State or Federal agencies as well as NGOs. Currently there are approximately 80 “sensitive” species utilizing Lower Klamath Refuge. With several exceptions, most of these species utilize wetland habitats provided for either waterfowl or non-game migratory birds. Species that require special habitat management consideration include the bank swallow, black tern, tricolored blackbird, and western pond turtle. These species are covered in the objectives for habitat(s) they occur in (Objectives 1.5 – 1.11). For more details on these species, see the “Fish and Wildlife” subsection in 5.2.2.

Goal 3 – Provide a range of wildlife dependent recreational opportunities that emphasize the natural setting and the functions of the Lower Klamath Refuge.

Objective 3.1 – Lower Klamath Refuge – Provide on-site Refuge specific curriculum to at least 3,000 students annually and off-site Refuge specific curriculum and outreach at a minimum of 6 special events annually.

Rationale – Environmental education is one of the six priority public uses of the Refuge system and should be fostered if compatible with the Refuge purpose and Refuge System mission. Interpreting the resources and challenges of the Refuge to the public and incorporating these topics into school curricula are important ways to influence the future well-being of the Refuge and the Klamath Basin resources. Environmental education can instill an appreciation for the value of and need for fish and wildlife habitat conservation. Lower Klamath Refuge is in a unique position to offer education agencies, teachers, and students an opportunity to study natural resource management and conservation issues in a remote outdoor setting. The importance of utilizing Refuges as outdoor classrooms to promote wildlife

conservation is a growing initiative for the Service. Developing and providing a limited number of educational programs or outreach events will support the Service's goals and promote an understanding of the importance of Lower Klamath Refuge to the National Wildlife Refuge System and to the regional ecosystem.

Monitoring Indicators: number of annual environmental education visits

| Alternative | | | | Strategies |
|-------------|---|---|---|--|
| A | B | C | D | |
| X | X | X | X | Emphasize Wetland Habitats and Birds in environmental education programs. |
| X | X | X | X | Maintain K-12 bird curriculum and K-8 wetlands curriculum and match to California and Oregon state standards. |
| | X | X | X | Develop a Walking Wetlands Curriculum. |
| | X | X | X | Continue to offer teacher training workshops for each of the curricula. |
| | X | X | X | Create partnerships with schools to develop schoolyard habitat programs. |
| X | X | X | X | Collaborate with partners such as Klamath Basin Audubon Society, Klamath Outdoor Science School, Great Outdoor Alliance, and others to assist with field trips on the Refuge and off-site education in the community and classrooms. |
| X | X | X | X | Utilize auto tour to provide bus tours on-site. |
| X | X | X | X | Provide outreach at special events which could include but not limited to: Winter Wings Festival, International Migratory Bird Day, 6th grade Forestry Tour, Youth Hunt BBQ, and various sportsmen shows. |
| | X | X | X | Develop an outreach event on waterfowl identification for youth hunters. |

Objective 3.2 – Lower Klamath Refuge – Provide high quality interpretive opportunities focused on Lower Klamath Refuge and its wildlife during all seasons for up to 20,000 visitors a year

Rationale – Interpretation is also one of the six priority public uses of the Refuge system that should be fostered if compatible with the Refuge purpose and Refuge System mission. Interpretation provides opportunities for visitors to make their own connections to the resource. By providing opportunities to connect to refuge resources, interpretation provokes participation in resource stewardship. It helps refuge visitors understand their relationships to, and impacts on, those resources. Improving existing interpretative facilities would allow visitors to garner an understanding of why the Refuge was established, what the Refuge provides, how it contributes ecologically to the regional landscape, and how it links to the rest of the Refuge system.

Monitoring Indicators: number of annual interpretive visits

| Alternative | | | | Strategies |
|-------------|---|---|---|---|
| A | B | C | D | |
| X | X | X | X | Maintain entrance kiosks and signs along auto-tour route. |
| X | X | X | X | Provide periodic nature interpretive programs for the public. |
| X | X | X | X | Provide brochures, maps, and visitor information to the public. |
| X | X | X | X | Ensure website contains current Refuge information. |
| | X | X | X | Provide additional interpretive programs. |
| | X | X | X | Construct a visitor contact station at entrance of Refuge. |
| | X | X | X | Update general brochures. |

| | | | | |
|--|----------|----------|----------|--|
| Objective 3.3 – Lower Klamath Refuge – Maintain adequate facilities and for visitors to observe, photograph, and enjoy the Refuge’s unique natural habitats and wildlife during all seasons of the year with a target of 25,000 visitor opportunities per year | | | | |
| Rationale – The National Wildlife Refuge System Improvement Act of 1997 identifies wildlife observation and photography as priority visitor uses for national wildlife refuges, along with hunting, fishing, environmental education, and interpretation. In Refuge planning and management, priority uses take precedence over other potential visitor uses. The Service strives to provide priority visitor uses when compatible with the purpose(s) and goals of the Refuge and the mission of the National Wildlife Refuge System (System). Providing opportunities for visitors to observe and photograph wildlife can instill an appreciation for the value of and need for fish and wildlife habitat conservation and foster a sense of stewardship for the Refuge System. Wildlife viewing, nature observation, and wildlife photography are some of the primary visitor activities at Tule Lake Refuge. Enhancing existing wildlife observation and photography opportunities on the Refuge would allow more visitors to experience, enjoy, and learn about native wildlife and plant species in the Klamath Basin and the Pacific Flyway. | | | | |
| Monitoring Indicators: number of annual wildlife observation and photography visits | | | | |
| Alternative | | | | Strategies |
| A | B | C | D | |
| X | X | X | X | Maintain photo blind, vehicle pull-offs, a wildlife overlook and a 10-mile auto-tour route. |
| X | X | X | X | Maintain safe conditions and adequate law enforcement at all visitor facilities. |
| X | X | X | X | Continue to monitor visitor use of Refuge lands and adaptively manage as appropriate to ensure use remains compatible. |
| | X | X | X | Develop another vehicle pull-off on State Line Road. |
| | X | X | X | Re-letter auto-tour route. |

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|--|
| Objective 3.4 – Lower Klamath Refuge – Maintain a high quality hunting program including opportunities for up to 10,000 annual hunting visits on up to 24,380 acres, depending on season length and climatic conditions. |
| <p>Rationale – Hunting is a wildlife-dependent general public use of the Refuge System and, by law, is to be given special consideration in refuge planning and management. The Refuge System Administration Act states that the Refuge System, “...was created to conserve fish, wildlife, and plants and their habitats and this conservation mission has been facilitated by providing Americans opportunities to participate in compatible wildlife-dependent recreation, including fishing and hunting, on System lands and to better appreciate the value of and need for fish and wildlife conservation.” This Act goes on to state that the Refuge System is to provide increased, compatible opportunities, “...for parents and their children to safely engage in traditional outdoor activities, such as fishing and hunting....” As a wildlife-dependent public use, hunting can also reconnect people, including youth, with the natural world and help address nature-deficit disorder (Louv 2005). This potential would be furthered through implementation of youth waterfowl hunts on the Refuge.</p> <p>Service policy states that hunting is, “...a healthy, traditional outdoor pastime, deeply rooted in the American heritage. Hunting can instill a unique understanding and appreciation of wildlife, their behavior, and their habitat needs.” “Hunting programs can promote understanding and appreciation of natural resources and their management on lands and waters in the Refuge System” (Hunting, 605 FW 2). Service policy states that hunting is an appropriate use of the National Wildlife Refuge System (Appropriate Refuge Uses, 603 FW 1). The Refuge System Administration Act states that, “When managed in accordance with principles of sound fish and wildlife management and administration... [wildlife-dependent public uses, including hunting]...have been and are expected to continue to be generally compatible uses,” and when determined compatible, quality hunting opportunities on refuges are to be facilitated, that is, strongly encouraged. Even if they find it objectionable, non-consumptive</p> |

| wildlife-dependent recreationists (e.g., those observing or photographing wildlife and those engaged in environmental interpretation) need to share the Refuge and its wildlife with visitors engaged in other compatible wildlife-dependent uses, including waterfowl hunting. | | | | |
|---|---|---|---|---|
| Monitoring Indicators: number of annual hunting visits | | | | |
| Alternative | | | | Strategies |
| A | B | C | D | |
| X | X | X | X | Continue to offer a diversity of waterfowl and pheasant hunting opportunities for sportsmen. |
| X | X | X | X | Maintain waterfowl only hunt areas; pheasant only hunt areas and joint waterfowl and pheasant hunting. |
| X | X | X | X | Maintain hunting opportunities via large free roam areas, flooded pit blinds and mobility impaired hunt areas. |
| X | X | X | X | Maintain hunt area accessibility via auto, motor boats, canoe style boats and walk-in. |
| X | X | X | X | Maintain hunt areas in a variety of habitats including flooded marsh, dry and flooded grain fields, and upland fields. |
| X | X | X | X | Continue to hold a post-season hunting meeting to gather concerns, suggestions, and other information about the hunt. Use the information gathered to make appropriate adjustments to improve the quality of the hunt program. |
| X | X | X | X | Maintain safe conditions and adequate law enforcement at all visitor facilities. |
| X | X | X | X | Continue to monitor visitor use of Refuge lands and adaptively manage as appropriate to ensure use remains compatible. |
| X | X | X | X | Maintain a hunt program consistent with California and Oregon State hunting dates and regulations. |
| X | X | X | X | Maintain existing hunting fee. |
| X | X | X | X | Continue to utilize advanced reservation system via lottery drawing on the opening weekend of the hunt season. |
| | X | X | X | Provide drive-in, boat-in wheelchair accessible hunting opportunities. |
| | X | X | X | Prepare a hunt plan which comprehensively evaluates Lower Klamath Refuge hunt program, including: guide program (i.e., maintain, modify, or eliminate guide program); layout of hunt area and auto tour route (i.e., maintain or separate in time or space); and hunt fees (i.e., maintain or increase fee). |
| | | X | X | To reduce the likelihood that boats would contribute to invasive species problems on the Refuge, the Service would pursue partnerships with the states of California and Oregon to develop and operate a portable decontamination station(s) near boat launches on the Refuge and/or pursue other measures to address this concern. |
| | | X | X | Phase in a new requirement allowing only 4-stroke (4-cycle) boat motors to be used on the Refuge. |

Goal 4 – Manage, conserve, evaluate, and interpret the cultural heritage and resources of the Refuge Complex while consulting with appropriate Native American groups and preservation organizations, and complying with historic preservation legislation.

Objective 4.1 – Lower Klamath Refuge – Implement a proactive cultural resources management program that focuses on meeting the requirements of the National Historic Preservation Act, including consultation, identification, inventory, evaluation, and protection of cultural resources.

Rationale – Various federal historic preservation laws and regulations require the Service to implement the kind of program described under this objective. Inattention to these responsibilities may obstruct the Refuge in its other land, habitat, and wildlife management efforts.

| Alternative | | | | Strategies |
|-------------|---|---|---|--|
| A | B | C | D | |
| X | X | X | X | Identify archaeological sites that coincide with existing and planned roads, facilities, public use areas, and habitat projects. Evaluate threatened and impacted sites for eligibility to the National Register of Historic Places. Prepare and implement activities to mitigate impacts to sites as necessary. |
| | X | X | X | Implement a program to evaluate eligibility to the National Register of Historic Places those archaeological sites that may be impacted by Service undertakings, management activities, erosion, or neglect. |
| | X | X | X | Develop a GIS layer for cultural resources that can be used with other GIS layers for the Refuge, yet contains appropriate locks to protect sensitive information. |
| | X | X | X | Develop partnerships with the Tribes for cultural resources inventory, evaluation, and project monitoring, consistent with the regulations of the National Historic Preservation Act. |
| | X | X | X | Perform an inventory and assessment of archaeological and historic sites to determine NRHP eligibility. As part of this inventory, identify specific stabilization and restoration costs. This should include prioritization of the most critical needs for each site and structure. |
| | X | X | X | Develop partnerships (e.g., University of Oregon, National Park Service) to assist in the stabilization and restoration of archaeological and historic sites and structures. |

Objective 4.2 – Lower Klamath Refuge – Develop, in partnership with The Klamath Tribes and other preservation partners, a program for the protection, education, and interpretation of cultural resources of the Refuge Complex.

Rationale – Cultural resources are not renewable. Thus, interpretation of cultural resources can instill a conservation ethic among the public and others who encounter or manage them. The goals of the cultural resource education and interpretive program are fourfold: (1) translate the results of cultural research into media that can be understood and appreciated by a variety of people, (2) relate the connection between cultural resources and natural resources and the role of humans in the environment, (3) foster an awareness and appreciation of native cultures, and (4) instill an ethic for the conservation of our cultural heritage.

| Alternative | | | | Strategies |
|-------------|---|---|---|--|
| A | B | C | D | |
| | X | X | X | Prepare interpretive media (e.g., pamphlets, signs, exhibits) that relate the cultural resources. |
| | X | X | X | Prepare environmental/cultural education materials for use in local schools and museums concerning cultural resources, the discipline of archaeology, the perspective of Native Americans, the history of the area, and conservation of natural and cultural resources. These materials could include an artifact replica kit with hands-on activities and curriculum prepared in consultation with the local school district, historical societies, and the Tribes. |
| | X | X | X | Consult with the Tribes, historical societies, and other preservation partners to identify the type of cultural resources information appropriate for public interpretation. |

| | | | | |
|--|---|---|---|---|
| | X | X | X | Develop an outreach program and materials so that the cultural resource messages become part of cultural events in the area, including National Wildlife Refuge Week and appropriate local festivals. |
| | | X | X | Develop Museum Property Inventory. Create storage and use plans for museum property as part of the outreach program. |

Objective 4.3 – Lower Klamath Refuge – Create and utilize a Memorandum of Agreement with Native American groups to implement the inadvertent discovery clause of the Native American Graves Protection and Repatriation Act (NAGPRA).

Rationale – Development of a Memorandum of Agreement prior to an inadvertent discovery is strongly suggested by the NAGPRA implementing regulations. Such an agreement can greatly facilitate and speed up consultations as required by law after an inadvertent discovery.

| Alternative | | | | Strategies |
|-------------|---|---|---|--|
| A | B | C | D | |
| | X | X | X | Identify Native American Tribes, Groups, and direct lineal descendants that may be affiliated with the Refuge lands. |
| | X | X | X | Open consultation process with affiliated Tribes, Groups, and direct lineal descendants. |
| | X | X | X | Define funerary objects, sacred objects and objects of cultural patrimony. |
| | X | X | X | Develop procedures to follow for intentional and inadvertent discoveries. |
| | X | X | X | Identify persons to contact for the purposes of NAGPRA. |

CLEAR LAKE NATIONAL WILDLIFE REFUGE

Goal 1 – Protect, maintain, and restore sagebrush-steppe and associated upland and wetland communities’ characteristics of the Great Basin Ecosystem.

Objective 1.1 – Clear Lake Refuge – Over the next 15 years, maintain the current native plant density and distribution of 15-25% sagebrush canopy cover, 15% grass cover, and 10% forb cover. Restore 3,000 acres of fire-degraded sagebrush-steppe communities in the “U” Unit to the same composition and cover as the intact communities. Reduce invasive annual grasses to less than 25%.

Rationale – Sage grouse survival and reproduction are influenced by the quality and quantity of sagebrush habitat. The importance of sagebrush as a source of cover and food is essential throughout the life cycle. Sage grouse require a variety of plant community composition for breeding, nesting, brood rearing, and wintering. The structure and densities of shrub canopy that sage grouse use changes throughout the year, from open areas used for leks, to moderately dense (10-25%) sites used for nesting (Popham and Gutierrez 2003) and brood rearing habitat, to highly variable areas (10-30%) used for wintering (Connelly et al. 2000).

The sagebrush habitat currently contains many of the food and cover components that meet the requirements for sage grouse throughout the annual life cycle. The immediate strategy to preserve the limited existing sagebrush habitat is wildfire suppression. In addition to fire suppression, several other strategies exist to assist in maintaining or enhancing the habitat. Given the relatively low density and distribution of invasive annuals in the sagebrush habitat, chemical treatment may be effective in reducing and controlling these undesirable annuals. Since western juniper is the primary vegetation threat to sagebrush habitat, juniper tree removal is essential for habitat restoration.

Most of the non-sagebrush habitat on Clear Lake Refuge is a result of recent wildfires. Non-sagebrush habitat can provide sage grouse nesting habitat. Given the extensive invasion of annual grasses and the limited density of native plant species in the area burned in the Clear Fire, potential strategies will require a combination of approaches. Chemical treatment of annual grasses may reduce the density of these species, but the layered thatch of medusahead may persist for several years and will maintain an elevated fire potential. Wildland fire suppression is important to prevent further degradation of this habitat. Conducted at the proper time, livestock grazing is useful in reducing fuels produced by early season annual grasses. Encroaching western juniper into the non-sagebrush habitat should be removed.

Monitoring Indicators: annual sage grouse lek surveys (April 1 – June 1), annual sage-steppe vegetation surveys (mid-June), annual greater sage grouse telemetry surveys (year-round)

| Alternative | | Strategies |
|-------------|---|---|
| A | B | |
| X | X | Suppress wildland fire in sage brush habitat. |
| X | X | Remove encroaching western juniper. |
| X | X | Use livestock grazing to reduce fuels produced by early season and annual grasses. |
| X | X | Conduct annual sage grouse lek surveys (April 1 – June 1). |
| X | X | Scout, map, and control priority weed species with an emphasis on protecting high priority wildlife habitats. |
| X | X | Evaluate chemical applications of pesticides according to USFWS and DOI policies, Refuge Integrated Pest Management Plan, and Pesticide Use Proposals. |
| | X | Develop a habitat management plan that includes SMART objectives for each refuge habitat, monitoring programs that track achievement of both population and habitat objectives, and thresholds for taking management actions. |
| | X | Work with Intermountain Research and Extension Station to develop control strategies targeted toward exotic annual grasses while protecting native grasses, shrubs, and forbs. |

| | | |
|--|---|--|
| | X | Develop a rapid assessment and control program for new invasive species. |
| | X | Develop inventory and monitoring plan focused on priority species including sage-grouse and colonial nesting waterbirds on island. |

Objective 2.1 – Clear Lake Refuge – Shoreline Habitat. Over the next 15 years, maintain and promote native forbs (20%) and native grasses (25%) to meet the cover requirements of brooding sage grouse hens. Reduce the density of invasive annual grasses to less than 25%.

Rationale – Sage grouse brood habitat has been described in other areas as having moderate sagebrush canopy cover (10 - 25%) and herbaceous understory of grass (15%), and forb (10%) canopy (Connelly et al. 2000). In contrast, a study in Nevada recorded brooding hens using wet meadows with no shrub cover, but ample grass cover (58%) and forb cover (22%, Klebenow 1985). Results from our research suggest that sage grouse around Clear Lake Refuge use both habitats during early brooding, but eventually most monitored brooding hens moved to wet meadow habitat later in the season.

Seasonal fluctuations in Clear Lake water levels result in shoreline areas that provides brood rearing habitat for sage grouse and high energy seeds during spring and fall migrations for dabbling ducks (e.g., pintails). Promoting native forbs and perennial grasses with sufficient canopy cover and height will provide food (plant material and insects) and protection for sage grouse during the brood rearing period. However, achieving desired habitat conditions in this zone will be challenging as periodic high water elevations in the lake destroy all upland vegetation in the shoreline zone. When water levels recede, the open shoreline is more rapidly colonized by invasive annual grasses than perennial native plants.

Monitoring Indicators: annual sage grouse lek surveys (April 1 – June 1), annual sage-steppe vegetation surveys (mid-June), annual greater sage grouse telemetry surveys (year-round), periodic waterfowl surveys (Sept – April)

| Alternative | | Strategies |
|-------------|---|---|
| A | B | |
| X | X | Scout, map, and control priority weed species with an emphasis on protecting high priority wildlife habitats. |
| X | X | Evaluate chemical applications of pesticides according to USFWS and DOI policies, Refuge Integrated Pest Management Plan, and Pesticide Use Proposals. |
| X | X | Use chemical treatment of invasive annuals. |
| X | X | Use livestock grazing to reduce invasive annual grasses. |
| | X | Develop a habitat management plan that includes SMART objectives for each refuge habitat, monitoring programs that track achievement of both population and habitat objectives, and thresholds for taking management actions. |
| | X | Work with Intermountain Research and Extension Station to develop control strategies targeted toward exotic annual grasses while protecting native grasses, shrubs, and forbs. |
| | X | Develop a rapid assessment and control program for new invasive species. |
| | X | Develop inventory and monitoring plan focused on priority species including sage-grouse and colonial nesting waterbirds on island. |

Goal 2 – Protect and maintain islands in Clear Lake Refuge to provide nesting habitat for colonial-nesting waterbirds.

Objective 2.1 – Clear Lake Refuge – Over the next 15 years, reduce or eliminate disturbance to the main Clear Lake nesting islands from March – June.

Rationale – Clear Lake reservoir is one of the main water storage reservoirs in the Klamath Reclamation

| <p>Project. Clear Lake Refuge is essentially an overlay refuge on this reservoir. Islands in Clear Lake Refuge provide important nesting habitat for species such as American white pelicans, Caspian terns, double crested cormorants, ring-billed and California gulls. These islands represent the largest and one of the few nesting areas for American white pelicans nesting in California. White pelicans are particularly prone to abandon nests and early hatched chicks if disturbed. As such, the remoteness of Clear Lake and its islands make this location ideal for the breeding species mentioned above. This objective seeks to protect the important nesting island from human disturbance during the breeding season. It is important to note that while the Service can control human visitation to the Refuge, Reclamation controls water levels in the Lake.</p> | | |
|--|---|--|
| <p>Monitoring Indicators: annual colonial waterbird surveys (methods and timing depend on the species), annual Caspian tern surveys (mid-June)</p> | | |
| Alternative | | Strategies |
| A | B | |
| X | X | Work with the Bureau of Reclamation to provide patrol and enforcement of a no disturbance area of at least $\frac{3}{4}$ of a mile from the nesting islands during sensitive time periods (March-June). |
| | X | Develop a habitat management plan that includes SMART objectives for each refuge habitat, monitoring programs that track achievement of both population and habitat objectives, and thresholds for taking management actions |
| | X | Develop a rapid assessment and control program for new invasive species. |
| | X | Develop inventory and monitoring plan focused on priority species including sage-grouse and colonial nesting waterbirds on island. |

Goal 3 – Wildlife Dependent Recreation: Provide a range of wildlife dependent recreational opportunities that emphasize the natural setting and the functions of the Clear Lake Refuge.

| <p>Objective 3.1 – Clear Lake Refuge – Provide off-site Refuge specific curriculum and outreach at a minimum of 6 special events annually.</p> | | |
|---|---|--|
| <p>Rationale – Environmental education is one of the six priority public uses of the Refuge system and should be fostered if compatible with the Refuge purpose and Refuge System mission. Interpreting the resources and challenges of the Refuge to the public and incorporating these topics into school curricula are important ways to influence the future well-being of the Refuge and the Klamath Basin resources. Environmental education can instill an appreciation for the value of and need for fish and wildlife habitat conservation. Developing and providing a limited number of educational programs or outreach events will support the Service’s goals and promote an understanding of the importance of Clear Lake Refuge to the National Wildlife Refuge System and to the regional ecosystem.</p> | | |
| <p>Monitoring Indicator: number of annual outreach events</p> | | |
| Alternative | | Strategies |
| A | B | |
| X | X | Provide environmental education programs in the Complex Visitor Center facility or in the classroom about sage-grouse and sage-steppe habitat. |
| | X | Work with local high schools to develop a monitoring program of sage-grouse. |
| X | X | Provide outreach to the public about Clear Lake Refuge, natural resources in the ecoregion and the National Wildlife Refuge System by hosting special events at the Complex Visitor Center and participating in off-site special events. |

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| Objective 3.2 – Clear Lake Refuge – Provide high quality wildlife observation, photography, and interpretive opportunities focused on Clear Lake Refuge and its wildlife during all seasons for up to 1,000 visitors a year. | | |
| Rationale – The National Wildlife Refuge System Improvement Act of 1997 identifies wildlife observation, wildlife photography, and interpretation as priority visitor uses for national wildlife refuges, along with hunting, fishing, and environmental education. In Refuge planning and management, priority uses take precedence over other potential visitor uses. The Service strives to provide priority visitor uses when compatible with the purpose(s) and goals of the Refuge and the mission of the National Wildlife Refuge System (System). Providing opportunities for visitors to observe and photograph wildlife can instill an appreciation for the value of and need for fish and wildlife habitat conservation and foster a sense of stewardship for the Refuge System. Opening the refuge to wildlife observation, photography and resource interpretive services on the Refuge would allow visitors to experience, enjoy, and learn about native wildlife and plant species in the Klamath Basin and the Pacific Flyway. | | |
| Monitoring Indicators: number of annual wildlife observation, photography, and interpretive visits | | |
| Alternative | | Strategies |
| A | B | |
| X | X | Provide information about Clear Lake Refuge at the Refuge Complex Visitor Center. |
| X | X | Maintain safe conditions and adequate law enforcement at all visitor facilities. |
| X | X | Continue to monitor visitor use of Refuge lands and adaptively manage as appropriate to ensure use remains compatible. |
| | X | Provide interpretive signs and a viewing platform on the boundary of the Refuge. |
| | X | Increase interpretive information at the Refuge Complex Visitor Center. |
| | X | Develop interpretive pamphlet to educate visitors on how they can prevent the spread of invasive species. |
| | X | Develop a Clear Lake Refuge exhibit in the Refuge Complex Visitor Center. |

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| Objective 3.3 – Clear Lake Refuge – Hunting. Maintain a high quality hunting program including opportunities for up to 200 annual hunting visits on up to 10,726 acres, depending on season length and climatic conditions. In addition, provide a limited pronghorn hunt for up to 6 hunters/day on the 6,320-acre peninsula “U” unit. |
| <p>Rationale – Hunting is a wildlife-dependent general public use of the Refuge System and, by law, is to be given special consideration in refuge planning and management. The Refuge System Administration Act states that the Refuge System, “...was created to conserve fish, wildlife, and plants and their habitats and this conservation mission has been facilitated by providing Americans opportunities to participate in compatible wildlife-dependent recreation, including fishing and hunting, on System lands and to better appreciate the value of and need for fish and wildlife conservation.” This Act goes on to state that the Refuge System is to provide increased, compatible opportunities, “...for parents and their children to safely engage in traditional outdoor activities, such as fishing and hunting....” As a wildlife-dependent public use, hunting can also reconnect people, including youth, with the natural world and help address nature-deficit disorder (Louv 2005). This potential would be furthered through implementation of youth waterfowl hunts on the Refuge.</p> <p>Service policy states that hunting is, “...a healthy, traditional outdoor pastime, deeply rooted in the American heritage. Hunting can instill a unique understanding and appreciation of wildlife, their behavior, and their habitat needs.” “Hunting programs can promote understanding and appreciation of natural resources and their management on lands and waters in the Refuge System” (Hunting, 605 FW 2). Service policy states that hunting is an appropriate use of the National Wildlife Refuge System (Appropriate Refuge Uses, 603 FW 1). The Refuge System Administration Act states that, “When managed in accordance with principles of sound fish and wildlife management and administration...</p> |

[wildlife-dependent public uses, including hunting]...have been and are expected to continue to be generally compatible uses,” and when determined compatible, quality hunting opportunities on refuges are to be facilitated, that is, strongly encouraged. Even if they find it objectionable, non-consumptive wildlife-dependent recreationists (e.g., those observing or photographing wildlife and those engaged in environmental interpretation) need to share the Refuge and its wildlife with visitors engaged in other compatible wildlife-dependent uses, including hunting.

Monitoring Indicators: number of annual waterfowl and antelope hunting visits

| Alternative | | Strategies |
|-------------|---|--|
| A | B | |
| X | X | Maintain waterfowl hunting opportunities for sportsmen by offering a large free roam hunt area. |
| X | X | Maintain walk-in only hunting opportunities. |
| X | X | Maintain a hunt program consistent with California State hunting dates and regulations. |
| X | X | Maintain no hunting fee. |
| X | X | Continue to provide special draw antelope hunting opportunities for big game hunters. |
| X | X | Continue to coordinate with California Department of Fish and Wildlife to maintain special drawing and fees regulated through the State of California. |
| X | X | Maintain safe conditions and adequate law enforcement at all visitor facilities. |
| X | X | Continue to monitor visitor use of Refuge lands and adaptively manage as appropriate to ensure use remains compatible. |
| | X | Revise antelope hunt to require non-toxic ammunition. |

Goal 4 – Manage, conserve, evaluate, and interpret the cultural heritage and resources of Clear Lake Refuge while consulting with appropriate Native American groups and preservation organizations, and complying with historic preservation legislation.

Objective 4.1 – Clear Lake Refuge – Implement a proactive cultural resources management program that focuses on meeting the requirements of the National Historic Preservation Act, including consultation, identification, inventory, evaluation, and protection of cultural resources.

Rationale – Various federal historic preservation laws and regulations require the Service to implement the kind of program described under this objective. Inattention to these responsibilities may obstruct the Refuge in its other land, habitat, and wildlife management efforts.

| Alternative | | Strategies |
|-------------|---|--|
| A | B | |
| X | X | Identify archaeological sites that coincide with existing and planned roads, facilities, public use areas, and habitat projects. Evaluate threatened and impacted sites for eligibility to the National Register of Historic Places. Prepare and implement activities to mitigate impacts to sites as necessary. |
| | X | Implement a program to evaluate eligibility to the National Register of Historic Places those archaeological sites that may be impacted by Service undertakings, management activities, erosion, or neglect. |
| | X | Develop a GIS layer for cultural resources that can be used with other GIS layers for the Refuge, yet contains appropriate locks to protect sensitive information. |

| | | |
|--|---|--|
| | X | Develop partnerships with the Tribes for cultural resources inventory, evaluation, and project monitoring, consistent with the regulations of the National Historic Preservation Act. |
| | X | Perform an inventory and assessment of archaeological and historic sites to determine NRHP eligibility. As part of this inventory, identify specific stabilization and restoration costs. This should include prioritization of the most critical needs for each site and structure. |
| | X | Develop partnerships (e.g., University of Oregon, National Park Service, etc.) to assist in the stabilization and restoration of archaeological and historic sites and structures. |

Objective 4.2 – Clear Lake Refuge – Develop, in partnership with the Klamath Tribes and other preservation partners, a program for the protection, education, and interpretation of cultural resources of the Refuge Complex.

Rationale – Cultural resources are not renewable. Thus, interpretation of cultural resources can instill a conservation ethic among the public and others who encounter or manage them. The goals of the cultural resource education and interpretive program are fourfold: (1) translate the results of cultural research into media that can be understood and appreciated by a variety of people, (2) relate the connection between cultural resources and natural resources and the role of humans in the environment, (3) foster an awareness and appreciation of native cultures, and (4) instill an ethic for the conservation of our cultural heritage.

| Alternative | | Strategies |
|-------------|---|--|
| A | B | |
| | X | Prepare interpretive media (e.g., pamphlets, signs, exhibits) that relate the cultural resources. |
| | X | Prepare environmental/cultural education materials for use in local schools and museums concerning cultural resources, the discipline of archaeology, the perspective of Native Americans, the history of the area, and conservation of natural and cultural resources. These materials could include an artifact replica kit with hands-on activities and curriculum prepared in consultation with the local school district, historical societies, and the Tribes. |
| | X | Consult with the Tribes, historical societies, and other preservation partners to identify the type of cultural resources information appropriate for public interpretation. |
| | X | Develop an outreach program and materials so that the cultural resource messages become part of cultural events in the area, including National Wildlife Refuge Week and appropriate local festivals. |
| | X | Develop Museum Property Inventory. Create storage and use plans for museum property as part of the outreach program. |

Objective 4.3 – Clear Lake Refuge – Create and utilize a Memorandum of Agreement with Native American groups to implement the inadvertent discovery clause of the Native American Graves Protection and Repatriation Act (NAGPRA).

Rationale – Development of a Memorandum of Agreement prior to an inadvertent discovery is strongly suggested by the NAGPRA implementing regulations. Such an agreement can greatly facilitate and speed up consultations as required by law after an inadvertent discovery.

| Alternative | | Strategies |
|-------------|---|--|
| A | B | |
| | X | Identify Native American Tribes, Groups, and direct lineal descendants that may be affiliated with the Refuge lands. |

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|--|---|--|
| | X | Open consultation process with affiliated Tribes, Groups, and direct lineal descendants. |
| | X | Define funerary objects, sacred objects and objects of cultural patrimony. |
| | X | Develop procedures to follow for intentional and inadvertent discoveries. |
| | X | Identify persons to contact for the purposes of NAGPRA. |

TULE LAKE NATIONAL WILDLIFE REFUGE

Goal 1 – Provide wetland and agricultural habitats that meet food and cover requirements sufficient to support migratory waterfowl and non-game waterbird population objectives throughout the annual cycle while promoting the highest possible natural biological diversity of refuge habitats.

Overarching Objectives

| Objective 1.1 – Water – Tule Lake Refuge. Over the next 15 years, seek to secure and efficiently distribute water of sufficient quantity and quality to achieve habitat and population objectives. | | | |
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| Rationale – Tule Lake Refuge receives primarily return flows from private agricultural lands north and east of the refuge. Permanent wetland habitat on the refuge is comprised of Sumps 1A and 1B which act as collecting basins for agricultural return flows during the spring/summer irrigation season and runoff during winter and spring precipitation events. Sumps 1A and 1B are surrounded by agricultural lands (Sumps 2 and 3) which are leased to local farmers under provisions within the Kuchel Act of 1964. Excess water in Sumps 1A and 1B is removed via a tunnel (D plant) through Sheepy Ridge to Lower Klamath Refuge. By removing excess water from the Tule Lake sumps, D Plant is one way of regulating water levels in the sumps of Tule Lake Refuge and a primary source of water for wetlands on Lower Klamath Refuge. Currently, Tulelake Irrigation District (TID) is responsible for 100% of D Plant operation and maintenance costs. In recent years, increasing electrical costs and water efficiency in the Tulelake Irrigation District has reduced output from D Plant, especially during the irrigation season. Flexibility in operating D Plant and utilizing D Plant as a timely water supply source for Lower Klamath Refuge would be beneficial to this refuge. | | | |
| Monitoring Indicator: acre-feet of water delivered to the refuge | | | |
| Alternative | | | Strategies |
| A | B | C | |
| X | X | X | Maintain 1905 irrigation right and Federal Reserved rights pursuant to 2013 Final Order and Determination (FOD). |
| X | X | X | Reclamation delivers water to agricultural lands and Sumps 1A and 1B according to Reclamation's within project priority ranking. Water is delivered during irrigation season to lease lands by Tulelake Irrigation District. |
| X | X | X | Excess water from irrigation return flows and winter run off is pumped to Lower Klamath Refuge through D Plant. |
| X | X | X | Maintain existing water delivery facilities. |
| X | X | X | Improve water conservation and efficiencies to optimize existing water use. |
| X | X | X | Seek opportunities to offset increasing power and pumping rates. |
| X | X | X | Monitor water quality of delivered water supplies, pass through water, and spill water. |
| X | X | X | Identify water quality issues and employ BMPs and with the assistance of partners and other agencies. |
| X | X | X | Continue to assist with Lost River TMDL planning and implementation. |
| | X | X | Explore feasibility of utilizing groundwater at south end of Tule Lake Refuge. |

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|---|--|--|--|
| Objective 1.2 – Managed Habitat Complex – Tule Lake Refuge. Over the next 15 years, provide the proper mix and juxtaposition of habitats to provide for waterfowl and focal nongame waterbird species. | | | |
| Rationale – A mix of habitats is desirable for several reasons. Habitat complexes tend to be complementary, with the strength of one habitat compensating for weakness in another. For example, | | | |

while agricultural habitats can provide the greatest energy per acre, wildlife diversity is low. In contrast, food energy densities are lower in wetlands but the diversity of foods provided and number of wildlife species is greater (Reinecke *et al* 1989). “Various types of wetlands are required to match the seasonal needs of waterfowl and, for optimal production, the appropriate types must be included on those public and private landscapes managed for waterfowl” (Bolen 2000). Because agricultural foods contain insufficient protein and/or a full complement of required amino acids (Baldassarre *et al.* 1983), and support a relatively limited assemblage of waterfowl species, experts believe that agricultural crops should be limited to the minimum necessary to satisfy food production objectives that cannot be provided from more “natural” foods (Reinecke *et al.* 1989).

Using waterfowl population objectives in concert with food resources provided by different refuge habitats allows refuge managers and biologists to estimate the quantity and type of habitats needed to support population objectives. Thus, population objectives become thresholds toward which direct habitat management (quantity, quality, diversity, seasonality, location, etc.) is targeted. Inventory and monitoring of populations are then used to evaluate actual waterfowl populations and habitat use as part of an adaptive management process.

In addition to the year-specific matrix of habitats, there is a rotational component to the program. Walking wetlands (i.e., flood/fallow) is a program that incorporates wetlands into commercial crop rotations on Tule Lake as well as private lands. These wetlands provide significant habitat benefits for those wildlife species dependent on early successional wetlands. In addition, wetlands within crop rotations sequester nutrients and suppress soil pathogens and weeds, thus enhancing crop productivity and reducing pesticide and fertilizer inputs.

Monitoring Indicator: vegetation mapping

| Alternative | | | Strategies |
|-------------|---|---|--|
| A | B | C | |
| X | X | X | Develop annual habitat management plans that prioritize habitat enhancement and restoration needs as well as the maintenance of the water management system. |
| X | X | X | Set annual habitat objectives each spring based on March water delivery projections and acreage of permanent and seasonal wetlands carried over from the previous year. |
| X | X | X | Through the walking wetlands program, rotate wetlands and agricultural lands to setback the gradual increase in emergent vegetation that occurs with normal successional processes in wetlands. This rotation among several management units over time allows for a gradation of successional stages (diversity) among wetlands and provides small grains used by waterfowl and sandhill cranes. |
| X | X | X | Monitor waterfowl populations to determine if population objectives are achieved. |
| X | | | Base habitat objectives on the mean 1990s abundance for all waterfowl guilds. |
| | X | X | Base habitat objectives on providing sufficient habitat to support the 75th percentile of 1970s duck and 1990s goose populations (Appendix M). |
| | X | X | Develop a habitat management plan that includes SMART objectives for each refuge habitat, monitoring programs that track achievement of both population and habitat objectives, and thresholds for taking management actions. |
| | X | X | Maintain wetland production throughout the year – use habitat bioenergetics model to efficiently use water to produce highest quality matrix of wetland and upland habitat for migratory birds. |
| | X | X | Periodically monitor foraging values to ensure assumptions about food availability remain accurate. |
| | X | X | Monitor changes in the environment, such as vegetation communities, wildlife trends, and surface and groundwater levels, to assess the effects of climate change on the Refuge. |

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| | X | X | Update the Inventory and Monitoring Plan. |
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| Objective 1.3 – Sustainable agricultural practices – Tule Lake Refuge. Over the next 15 years, promote sustainable agricultural practices on leased land and cooperatively farmed units, consistent with principles of waterfowl management and energetic needs of waterfowl. | | | |
| Rationale – In terms of the Refuge’s agricultural lands (leased and cooperative farm lands), proper waterfowl management is defined as: providing sufficient agricultural foods to sustain waterfowl population objectives for fall and spring migrant geese and dabbling ducks (mallard and pintails primarily) as well as providing sufficient foods to alleviate depredation of crops on private lands. Refuge agricultural programs should be managed synergistically with other refuge habitats such that the overall refuge habitat program provides the diversity of habitats and food resources required. Proper waterfowl management in this context also means that post-harvest practices increase the attractiveness of fields to migratory waterfowl and that waterfowl can reach these fields with minimal energetic costs. | | | |
| Monitoring Indicator: vegetation mapping (acres of grain and other crops managed organically; acres of walking wetlands), Fall Sandhill Crane Staging Survey, Fall Staging Waterbird Survey, periodic waterfowl surveys | | | |
| Alternative | | | Strategies |
| A | B | C | |
| X | X | X | Provide agricultural habitats through the issuance of cooperative farming and lease land contracts with local farmers, consistent with provisions of the Kuchel Act. |
| X | X | X | Consistent with proper water waterfowl management, continue the present pattern of leasing. |
| X | X | X | Maintain up to 15,500 acres of Lease Land crops such as small grains, alfalfa, onions, and potatoes. Allow other crops within lease lands on a case-by-case basis if all wetland and agricultural habitat objectives are met. |
| X | X | X | Provide agricultural habitats through the issuance of cooperative farming and lease land contracts with local farmers, consistent with provisions of the Kuchel Act. |
| X | X | X | Evaluate and permit chemical applications are according to USFWS and DOI policies, Refuge Integrated Pest Management Plan, and Pesticide Use Proposals. |
| X | X | X | Cooperative farm land participants are selected based on ability to provide conservation benefits on private lands. |
| | X | X | Leverage more wetland habitat on private lands in the basin by expanding the use of preferential permits for cooperatively farmed grain and hay units for farmers that participate in the Walking Wetlands program on their private lands. |
| | X | X | Periodically evaluate the leasing program to ensure that sufficient agricultural foods are available to support spring and fall population objectives for geese and dabbling ducks. |
| | X | X | Require annual SUPs for Reclamation with stipulations and prescribed habitat mix based on the energetics modeling. |
| | X | X | Require annual SUPs for commercial contractors (i.e., fertilizer, pesticide applications). |
| | X | X | Require stipulations and all other specific requirements from the SUPs be included as part of lease contracts. |
| | | X | Expand area of lease land and cooperatively farmed units that are managed organically. |
| | | X | Expand incentives such as lease extensions for farmers that manage fields organically. |
| | | X | Increase attractiveness of agricultural lands to waterfowl with fall flooding. |

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| Objective 1.4 – Disease Prevention – Tule Lake Refuge. Over the next 15 years, continue to minimize the occurrence, spread, and severity of avian cholera and botulism outbreaks. | | | |
| Rationale – Since the 1940s when 100,000 birds died of botulism, waterfowl disease problems have | | | |

occurred almost annually on Tule Lake and Lower Klamath Refuges; avian cholera and botulism type C cause the greatest mortality. Avian cholera was first recorded in 1955 and some winters have claimed up to 20,000 birds. Other chronic disease problems that occur each year but are not contagious and cause less mortality include lead poisoning, aspergillosis, and tuberculosis. Disease data is collected by management unit. Ultimately, this information is used to determine if particular management activities precipitate disease outbreaks or if certain geographical areas are prone to disease.

Monitoring Indicator: number of bird deaths due to avian cholera, botulism, and other diseases

| Alternative | | | Strategies |
|-------------|---|---|--|
| A | B | C | |
| X | X | X | Implement the wildlife disease management plan. |
| X | X | X | Patrol wetland areas that have been historically associated with botulism on the Refuge in order to quickly detect and respond to outbreaks. |
| X | X | X | Remove sick and dead birds from wetlands. |

Objective 1.5 – Sanctuary – Tule Lake Refuge. Over the next 15 years, continue to provide 60% of the Tule Lake Refuge’s landbase as sanctuary to provide high quality resting, foraging, and nesting habitat for waterfowl and other wildlife.

Rationale – Sanctuaries are areas on the Refuge that are closed to public use. They provide places where human-caused disturbances are reduced, thereby reducing the interruption of wildlife activities, such as foraging, resting, breeding, feeding nestlings, and other maintenance activities. Sanctuaries are especially important during high visitor use periods. They are also important for wildlife to avoid predation by other wild animals, as they can devote less energy to avoiding humans and more to avoiding predators.

In some cases, short-term sanctuaries may be established on the Refuge to protect a sensitive nesting colony or site. These seasonal sanctuaries may impose public access restrictions at some nesting sites for species with a low tolerance for human disturbance.

Monitoring Indicator: see indicators for habitat objectives

| Alternative | | | Strategies |
|-------------|---|---|---|
| A | B | C | |
| X | X | X | Over the next 15 years, continue to provide 60% of the Tule Lake Refuge’s landbase as sanctuary to provide resting, foraging, and nesting habitat for waterfowl and other wildlife. |
| X | X | X | During the nesting season, minimize disturbance within ½ mile of nesting colonies on islands and in emergent wetlands. |

Objective 1.6 – Seasonal Wetlands – Tule Lake Refuge. Over the next 15 years, at least 200-3,000³ acres of seasonal wetlands occur at Tule Lake Refuge on an annual basis. Seasonal wetlands would be flooded beginning September-November and with water removed April-June.

Rationale – Seasonal wetlands were likely a significant proportion of the original Tule Lake and are critical to meeting the migratory waterfowl needs within the Refuge as well as the Pacific Flyway (see Fleskes and Battaglia 2004). In addition, this habitat provides brood areas for early nesting waterfowl species such as mallards (Mauser et al. 1994) and pintails and is extensively used by spring migrant shorebirds and other wildlife species.

In concert with the other habitat objectives, the seasonal wetland seeks to provide sufficient foods to support waterfowl populations depicted in Table 2. Habitat acreage needs are based on cooperative

³ Range in acreage values is due to periodic management of Sump 1B as seasonal wetland.

studies conducted by Oregon State University, Ducks Unlimited and the Service, which were completed in the early 2000s (see Appendix N). There is some flexibility in the proportion of habitats provided. For example, some species such as dabbling ducks (mallards, pintail, wigeon, etc.) forage in seasonal wetlands as well as grain fields. Thus, more seasonal marshes may mean less required grain crops; however, in this case, there is not necessarily an acre for acre comparison.

It is important to note that providing these habitats will not guarantee that the desired abundance of waterfowl will appear. There are many factors that influence waterfowl abundance in the Pacific Flyway such as habitat conditions elsewhere, breeding success in the north, and climatic conditions. However, not providing sufficient foods for target populations will insure that the Refuge cannot support these population objectives.

In addition to supporting waterfowl population objectives, the seasonal wetland objective seeks to provide sufficient habitat to provide for a migratory population of 700 long-billed dowitchers in spring (May) and 1,000 long-billed dowitchers during fall migration (July-August). It is important to note that these target populations are single point-in-time numbers. It is probable that that much higher numbers will actually use the refuge during migration as shorebirds on continually arriving as other move north or south in the Flyway. The long-billed dowitcher was selected as the priority species as it represents the habitats also needed by least and western sandpipers as well as a host of other fall and spring migrating shorebirds. In addition, the long-billed dowitcher is considered a priority 2 species in the Intermountain West Joint Venture Regional Shorebird Plan (Oring et. al. 2005). It is estimated that 500 acres of early spring seasonal marsh and 500 acres of August wetland will be required to achieve the spring and fall population targets, respectively.

Monitoring Indicators: vegetation mapping, breeding Canada goose pairs survey, breeding duck pairs survey, breeding sandhill crane survey, colonial waterbird surveys, fall sandhill crane staging survey, fall staging waterbird survey, mid-winter waterfowl survey, nongame waterbird breeding population survey, periodic waterfowl surveys, secretive marshbird surveys, spring shorebird survey, tule goose fall survey, wintering raptor surveys, wintering tule goose survey

| Alternative | | | Strategies |
|-------------|---|---|--|
| A | B | C | |
| X | X | X | Use disking, plowing, prescribed burning and crop rotation through grain in seasonal wetland units to set back vegetative succession and improve habitat conditions for waterfowl. |
| X | X | X | Manage water levels in management units to enhance wetlands for specific guilds of waterfowl and other nongame waterbird species. For example, lowering of water levels in wetland management units during migration can greatly increase use by shorebirds and waterfowl by exposing aquatic invertebrate food resources. |
| X | X | X | Continue to scout, map, and control priority weed species with an emphasis on protecting high priority wildlife habitats. |
| | X | X | Formalize ongoing pest management activities under an IPM program. |
| | X | X | Develop program for managing berms to reduce invasive species cover and improve cover for nesting waterfowl and other species. |
| | X | X | Use GPS to monitor weed populations. |
| | X | X | Expand use of non-pesticide tools to control invasive species (e.g., grazing, restoration plantings). |
| | X | X | Prevent the introduction of aquatic invasive species by pursuing partnerships with the states of California and Oregon to develop and operate a portable decontamination station(s) near boat launches on the Refuge. |

Objective 1.7 – Permanent Wetlands – Tule Lake Refuge. Over the next 15 years, 11,000-15,000⁴ acres of permanent wetlands occur at Tule Lake Refuge on an annual basis and include a mosaic of 20% emergent wetlands and 80% submergent wetlands. Emergent wetlands are characterized by tall emergent vegetation, including hardstem bulrush (*Scirpus acutus*) and cattail (*Typha* sp.) coverage ranging from 20-70% cover. Submergent wetlands are dominated by sago pondweed with lesser amounts of baby pondweed (*P. pusillus*) and coontail (*Ceratophyllum demersum*). Water depths in both wetlands range from 6 inches to 3 feet deep.

Rationale – Tule Lake Refuge consists of 2 return flow sumps consisting of 13,000 acres of primarily open water from 0.5 to 3.5 feet in depth. A 2,500 acre emergent marsh exists in the northeast corner of Sump 1A. Sedimentation of both Sumps 1A and 1B has reduced depths; however, depth losses have been greatest in the emergent marsh because of its proximity to the mouth of the Lost River. Open water areas are dominated by stands of sago pondweed with lesser quantities of water milfoil and coontail. The emergent marsh area is primarily hardstem bulrush with lesser quantities of cattail, American bur-reed, and sedge. During the summer months, extensive blankets of green algae often cover extensive areas of open water on the sumps.

In concert with the other habitat objectives, the permanent wetland habitat objective seeks to provide sufficient foods to support waterfowl populations depicted in Tables 2 and 4. Habitat acreage needs are based on cooperative studies conducted by Oregon State University, Ducks Unlimited and the Service, which were completed in the early 2000s (see Appendix N). It is important to note that providing these habitats will not guarantee that the desired abundance of waterfowl will appear. There are many factors that influence waterfowl abundance in the Pacific Flyway such as habitat conditions elsewhere, breeding success in the north, and climatic conditions. However, not providing sufficient foods for target populations will insure that the Refuge cannot support these population objectives.

This objective also seeks to provide at least 3,000 acres of permanent wetlands (flooded year round) with a tall emergent vegetation coverage ranging from 20-70%. This habitat should support a target population of 1,500 breeding white faced ibis and 800 breeding western/Clark's grebes. These two species were selected to represent a host of other summer breeding marsh birds including black-crowned night herons, great and snowy egrets, Forester's terns, Franklin's gull, and western/Clark's grebe. The western/eared grebe was selected as an umbrella species as Tule Lake Refuge represent one of the largest breeding colonies in California and the open water foraging habitats preferred by this species is used by several phalarope species as well as foraging habitat for fish-eating birds and fall migrating black terns.

The permanent wetland objective supports the long term conservation of the Lost River and shortnose sucker. Historic Tule Lake held large populations of both sucker species which spawned in the Lost River as far upstream as Bonanza, Oregon. Currently, Tule Lake Sump 1A is the primary habitat for the Lost River and shortnose sucker. Both species utilize habitats >3.0 feet deep and are seasonally specific as to habitat use areas. In summer (June-September), the fish can be found in the central portion of Sump 1A. Starting in October, the fish move to the northwest corner of the Sump where they reside through the winter and early spring. In April and May, the fish can be found in the area of the English Channel connecting Sumps 1A and 1B. During April, some fish attempt a spawning migration into the Lost River and attempt spawning below the Anderson-Rose dam. Annual habitat use of the fish was documented through a series of studies conducted by the U.S. Bureau of Reclamation and the Fish and Wildlife Service in the 1990s and 2000s.

Despite attempts to spawn in the Lost River, it is believed that this effort is largely unsuccessful. Most of the suckers occupying Tule Lake Refuge are believed to be entrained within the Klamath Project infrastructure and ultimately find themselves in the Project's terminal basin (Sump 1A). Specific water

⁴ Range in acreage values is due to periodic management of sumps as seasonal wetlands.

elevations are mandated for Sumps 1A to protect both sucker species.

Maintaining current water level management of Sump 1A to protect the suckers is contrary to the enhancement activities needed to improve habitat conditions for migratory wetland birds. A proposal to seasonally dry portions of Sump 1A would likely result in a short term take of the species; however, It likely that promoting diverse and productive wetland vegetation conditions would also improve water quality and habitat conditions for the suckers in the long-term. Implementation of this project will require balancing the habitat needs of multiple species while reducing the short term impacts to the suckers. Ultimately, however, the long-term objective is to maintain a population of both sucker species on the Refuge. Although not considered a viable population, the Refuge represents an area of historic occupation by suckers and is an important refugial area in in the event of a catastrophic loss of suckers elsewhere in the Klamath Basin.

Monitoring Indicators: vegetation mapping, breeding Canada goose pairs survey, breeding duck pairs survey, breeding sandhill crane survey, colonial waterbird surveys, fall sandhill crane staging survey, fall staging waterbird survey, mid-winter waterfowl survey, nongame waterbird breeding population survey, periodic waterfowl surveys, secretive marshbird surveys, tule goose fall survey, wintering raptor surveys, wintering tule goose survey

| Alternative | | | Strategies |
|-------------|---|---|---|
| A | B | C | |
| X | X | X | Use disking, plowing, prescribed burning and crop rotation through grain in permanent wetland units to set back vegetative succession and improve habitat conditions for waterfowl. |
| X | X | X | Continue to scout, map, and control priority weed species with an emphasis on protecting high priority wildlife habitats. |
| X | X | X | Formalize ongoing pest management activities under an IPM program. |
| X | X | X | Develop program for managing berms and levees to reduce invasive species cover and improve cover for nesting waterfowl and other species. |
| X | X | X | Use GPS to monitor weed populations. |
| | X | X | Expand use of non-pesticide tools to control invasive species (e.g., grazing, restoration plantings). |
| | X | X | Prevent the introduction of aquatic invasive species by pursuing partnerships with the states of California and Oregon to develop and operate a portable decontamination station(s) near boat launches on the Refuge. |
| | | X | Develop and implement plan to manipulate water elevations in Sumps 1A and 1B to improve wetland diversity and productivity. |

Objective 1.8 – Agricultural Habitats – Tule Lake Refuge. Over the next 15 years, approximately 3,400 acres of alfalfa/hay, 7,370 acres of harvested small grains, 1,500 acres of unharvested small grains, and 2,703 acres of potatoes occur on Tule Lake Refuge on an annual basis. All leased and cooperative farm lands will be managed to increase the attractiveness of the agricultural lands for waterfowl.

Rationale – Waterfowl use several basic food types, including aquatic and terrestrial invertebrates, seeds, agricultural foods, and other plant parts. Each food type provides different benefits depending on nutritional value, species of waterfowl, and requirements during the annual life cycle. During spring, some waterfowl species such as geese, have adapted their feeding behavior to the availability of agricultural crops such as small grains, potatoes, and alfalfa and hay fields. Agricultural foods are now a primary constituent of foods available in many of the major waterfowl wintering and migration areas of North America. The high energy value of agricultural crops complements the more nutritionally balanced but lower energy content of foods available in refuge wetlands. Taken together, this balance of “natural” and agricultural foods supports hundreds of thousands of waterfowl and other waterbirds each year.

In concert with the other habitat objectives, the agricultural habitat objective for Tule Lake Refuge seeks to provide sufficient foods to support waterfowl populations depicted in Tables 2 and 4. Habitat acreage needs are based on cooperative studies conducted by Oregon State University, Ducks Unlimited and the Service, which were completed in the early 2000s (see Appendix N). There is some flexibility in the proportion of habitats provided. For example, some species such as geese forage in grain as well as potato fields. Thus, more grain may mean less required potato crops; however, in this case, there is not necessarily an acre for acre comparison. It is important to note that providing these habitats will not guarantee that the desired abundance of waterfowl will appear. There are many factors that influence waterfowl abundance in the Pacific Flyway such as habitat conditions elsewhere, breeding success in the north, and climatic conditions. However, not providing sufficient foods for target populations will insure that the Refuge cannot support these population objectives.

Close proximity to wetlands not only increases the attractiveness of agricultural fields to waterfowl, it also reduces energetic costs of obtaining food resources. This provision also insures better bird distribution and utilization of agricultural lands, thereby dispersing birds and reducing the negative effects of density dependent waterfowl diseases (particularly avian cholera).

Crops grown on the refuge are consumed primarily by mallards and pintails (dabbling ducks), as well as geese, swans, and sandhill cranes and provide an important food resource for these birds during migration. Standing grains provide a rich source of carbohydrates and provides more food (kcal/acre) for less water than wetland plants, which is particularly important for migrating dabbling ducks and geese. This high source of carbohydrates is considered an integral part of achieving waterfowl objectives. Refuge alfalfa and hay fields attract large populations of spring migrant geese which alleviate potential damage to private farmlands off the refuge. During the spring waterfowl migration these areas are heavily used by white-fronted, cackling, and Ross's geese. Long-billed curlews and willets use these areas for nesting in late spring and white-faced ibis use pasture/hay areas extensively when under summer irrigation. Alfalfa is also an attractive crop to ground-nesting birds. Harvested potatoes are a food source for geese. However, it is important to note that the crops and associated farm lands do not provide for the needs of other waterfowl guilds such as diving ducks and other dabbling duck species.

Monitoring Indicators: vegetation mapping, fall sandhill crane staging survey, fall staging waterbird survey, mid-winter waterfowl survey, periodic waterfowl surveys, spring shorebird survey, tule goose fall survey, wintering raptor surveys, wintering tule goose survey

| Alternative | | | Strategies |
|-------------|---|---|---|
| A | B | C | |
| X | X | X | Cooperative farm land participants are selected based on ability to provide conservation benefits on private lands. |
| X | X | X | Maintain up to 2,500 acres of Cooperatively Farmed crops and wetlands under a crop share agreement. |
| X | | | At least 25-33% of grains on 400 acres are left standing for wildlife benefit. |
| | X | X | Increase unharvested standing grain to approximately 1,500 acres to support dabbling duck and geese population objectives during winter and spring. |
| | X | X | Periodically monitor foraging values to ensure assumptions about food availability remain accurate. |
| X | X | X | Continue to scout, map, and control priority weed species with an emphasis on protecting high priority wildlife habitats. |
| X | X | X | Formalize ongoing pest management activities on cooperative farm lands under an IPM program. |
| X | X | X | Develop program for managing berms and levees to reduce invasive species cover and improve cover for nesting waterfowl and other species. |
| X | X | X | Use GPS to monitor weed populations. |

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| | X | X | To disperse waterfowl use and lessen the potential for avian diseases, 1/2 of the grain leave should occur on cooperative farm lands (750 acres) and the other half on the lease lands (750 acres). |
| X | X | X | To prevent nest destruction from ground nesting birds, alfalfa cutting will be delayed until after July 15. |
| X | X | X | All farm lands will be flooded post-harvest to February 15 at the Service's discretion. |
| X | X | X | Burning or other post-harvest practices that increase the attractiveness of agricultural fields for waterfowl will be implemented at the discretion of the Service. |
| X | X | X | Allow lease land farmers to contract locally for prescribed burning of fields. |
| X | X | X | Harvesting methods in small grain fields that do not reduce stubble height below 12-15 inches ("stripper headers") are prohibited in harvesting operations, unless followed by mowing of the stubble. |
| X | X | X | Burning by lessees will be subject to Refuge approval to ensure that waterfowl habitat values of farmed lands are not compromised. The Service reserves the right to burn small grains within leases, post-harvest, at its discretion for waterfowl management purposes. All burning of Refuge agricultural lands will be consistent with Interior and Service fire policy as well as State of California and Oregon regulations. |
| X | X | X | Fall tillage of small grains will be subject to Refuge approval. In most cases, fall tillage has the potential to decrease the availability of waste grain for waterfowl and increase the susceptibility of the soils to wind erosion. |
| X | X | X | All lease land and cooperative farmers will adhere to the mandates of Interior and Service policy and the IPM plan, which balances pest control practices with the goals of agricultural production and profitability, consistent with waterfowl management as mandated by the Kuchel Act. |
| X | X | X | Pesticide applications to all Refuge farm lands must adhere to Interior and Service Policy which includes preparation and approval of Pesticide Use Proposals prior to any pesticide applications. |
| X | X | X | All farming and pesticide application procedures occurring on Tule Lake Refuge will be consistent with the 2007 and 2013 Biological Opinions and any subsequent Biological Opinions. |
| X | X | X | Burning or tillage of farm lands will not be allowed until it is assured that the farm program will have sufficient water. |
| X | X | X | Noxious weed control through the establishment of competitive plants will remain an ongoing program within the farming program. Establishment of more wildlife-beneficial habitats will suppress weed populations as well as provide enhanced habitat for ground-nesting birds and winter cover for other wildlife species. |
| X | X | X | Nitrogen and phosphorus fertilizer use on the agricultural lands should not be used in excess to what crops can consume. |
| | X | X | All farm lands must be managed such that all agricultural fields are within one mile of wetland habitat. |
| | | X | Increase attractiveness of agricultural lands to waterfowl with fall flooding, and improve the interspersions of wetlands within lease lands farm fields. |
| | | X | Expand area of lease land and cooperatively farmed units that are managed organically. |
| | | X | Expand area of lease land and cooperatively farmed units that are managed organically. |

Objective 1.9 – Walking Wetlands – Tule Lake Refuge. Over the next 15 years, walking wetlands are distributed throughout the lease lands on Tule Lake Refuge such that no field is greater than a mile from a wetland.

Rationale – The short-cycle wetland rotation program termed “Walking Wetlands” or “Flood Fallow” will be used to implement this stipulation. This flooding program has proven to provide diversified waterfowl habitat within the lease lands and has been an economically valuable agricultural practice to local farmers. Lease revenues have increased significantly on previously flooded lands since implementation of this program. In addition, this rotational wetland program provides habitat to many non-waterfowl species consistent with the Kuchel Act’s mandate to manage the refuges for “wildlife conservation.” The close proximity to wetlands not only increases the attractiveness of agricultural fields to waterfowl, it also reduces energetic costs of obtaining food resources. This ensures better bird distribution and utilization of agricultural lands, thereby dispersing birds and reducing the negative effects of density dependent waterfowl diseases (particularly avian cholera).

Fields are typically first flooded as soon after harvest as possible and are utilized almost immediately by fall migrant waterfowl and sandhill cranes as well as wintering raptors including large numbers of bald eagles. Following the wetland cycling, fields are returned to agricultural production. Waterbird use of flooded fields has been represented by a diversity of species including many that are considered “sensitive” by the State of California.

This objective seeks to provide sufficient habitat to provide for a migratory population of 700 long-billed dowitchers in spring (May) and 1,000 long-billed dowitchers during fall migration (July-August). It is important to note that these target populations are single point-in-time numbers. It is probable that that much higher numbers will actually use the refuge during migration as shorebirds on continually arriving as other move north or south in the Flyway. The long-billed dowitcher was selected as the priority species as it represents the habitats also needed by least and western sandpipers as well as a host of other fall and spring migrating shorebirds. In addition, the long-billed dowitcher is considered a priority 2 species in the Intermountain West Joint Venture Regional Shorebird Plan (Oring et. al. 2005). A minimum of 500 acres of early successional walking wetland habitat would be required to achieve the spring and fall population targets, respectively.

It is estimated that a minimum of 1,380 acres of walking wetlands would needed each year to achieve this objective.

Monitoring Indicators: vegetation mapping, fall sandhill crane staging survey, fall staging waterbird survey, mid-winter waterfowl survey, periodic waterfowl surveys, spring shorebird survey, tule goose fall survey, wintering raptor surveys, wintering tule goose survey

| Alternative | | | Strategies |
|-------------|---|---|---|
| A | B | C | |
| X | | | Maintain 0-2,700 acres (1,100 acres average) of walking wetlands on Tule Lake Refuge lease land and cooperatively farmed units. |
| X | X | X | Complete construction of dikes around lease land lots in Sump 3 where walking wetlands management is feasible. |
| | X | X | Construct dikes around lease land lots in Sump 2 where walking wetlands management is feasible. |
| | X | X | The Service will strive to ensure that walking wetlands are located such that agricultural fields are no more than one mile from wetland habitat. |
| | X | | Increase acreage (average of 1,380 acres) and interspersions of walking wetlands within lease land agriculture. |
| | | X | Increase acreage (average of 3,000 acres) and interspersions of walking wetlands within lease land agriculture. |

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| Objective 1.10 – Nesting Islands – Tule Lake Refuge. Over the next 15 years, continue to provide 2 acres of island nesting habitat during the nesting season to support colonial nesting waterbirds such as American white pelican. | | | |
| Rationale – Undisturbed islands for colonial nesting waterbirds are relatively uncommon in the Intermountain West and were a habitat utilized by breeding waterbirds in historic Tule Lake. Currently, two islands exist on Tule Lake Refuge, one of which was artificially constructed as a cooperative project with the Army Corp of Engineers. This objective seeks to provide two acres of island habitat which should support a target population of 200 breeding pairs of American white pelicans. White pelicans were selected as a priority species because only 2-3 breeding sites exist in California, the species is considered of high concern in the Intermountain West Waterbird Conservation Plan (Oring et. al. 2005), and white pelicans are sensitive to disturbance during the nesting season. Other species benefiting from this habitat include Caspian terns, double crested cormorants, and ringbilled and California gulls. | | | |
| Monitoring Indicators: colonial waterbird surveys | | | |
| Alternative | | | Strategies |
| A | B | C | |
| X | X | X | Develop annual habitat management plans that prioritize habitat enhancement and restoration needs as well as the maintenance of the water management system. |
| X | X | X | During the nesting season, minimize disturbance within ½ mile of nesting colonies. |
| X | X | X | Continue to scout, map, and control priority weed species with an emphasis on protecting high priority wildlife habitats. |
| X | X | X | Formalize ongoing pest management activities under an IPM program. |
| X | X | X | Use GPS to monitor weed populations. |
| | X | X | Expand use of non-pesticide tools to control invasive species (e.g., grazing, restoration plantings). |

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| Objective 1.11 – Uplands – Tule Lake Refuge. Within 10 years, prepare a habitat management plan covering 5,400 acres of upland habitats on Tule Lake Refuge. | | | |
| Rationale – Tule Lake Refuge contains approximately 5,400 acres of upland plant communities, including juniper woodland, sagebrush shrubland, and grassland. The peninsula area (southeast corner of the refuge) includes the largest block of upland habitat. It is composed primarily of cheatgrass, Idaho fescue, basin wildrye, rabbitbrush, and sagebrush. | | | |
| Monitoring Indicators: To be determined | | | |
| Alternative | | | Strategy |
| A | B | C | |
| | X | X | Develop a habitat management plan that includes SMART objectives, monitoring programs that track achievement of habitat objectives, and thresholds for taking management actions. |

Goal 2 – Support recovery and protection efforts for federally and state listed threatened and endangered species and sensitive species that occur within Tule Lake Refuge.

Sensitive species are those that are listed as endangered or threatened by State or Federal agencies or are considered of conservation concern by State or Federal agencies as well as NGOs. Currently there are approximately 76 “sensitive” species utilizing Tule Lake Refuge. With several exceptions, most of these species utilize wetland habitats provided for either waterfowl or non-game migratory birds. Species that require special habitat management consideration include both the shortnose and Lost Rivers suckers. Both species of suckers are listed under the Endangered Species Act. These species are covered in the objectives for habitat(s) they occur in (Objectives 1.5 – 1.9).

Goal 3 – Provide a range of wildlife dependent recreational opportunities that emphasize the natural setting and the functions of the Tule Lake Refuge.

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| Objective 3.1 – Tule Lake Refuge – Provide on-site Refuge specific curriculum to at least 3,000 students annually and off-site Refuge specific curriculum and outreach at a minimum of 6 special events annually. | | | |
| Rationale – Environmental education is one of the six priority public uses of the Refuge system and should be fostered if compatible with the Refuge purpose and Refuge System mission. Interpreting the resources and challenges of the Refuge to the public and incorporating these topics into school curricula are important ways to influence the future well-being of the Refuge and the Klamath Basin resources. Environmental education can instill an appreciation for the value of and need for fish and wildlife habitat conservation. Tule Lake Refuge is in a unique position to offer education agencies, teachers, and students an opportunity to study natural resource management and conservation issues in a remote outdoor setting. The importance of utilizing Refuges as outdoor classrooms to promote the importance of wildlife conservation is a growing initiative for the Service. Developing and providing a limited number of educational programs or outreach events will support the Service’s goals and promote an understanding of the importance of Tule Lake Refuge to the National Wildlife Refuge System and to the regional ecosystem. | | | |
| Alternative | | | Strategies |
| A | B | C | |
| X | X | X | Emphasize wetland habitats and birds in environmental education programs. |
| X | X | X | Maintain K-12 bird curriculum and K-8 wetlands curriculum and match to CA and OR state standards. |
| X | X | X | Provide outreach at special events which could include but not limited to: Winter Wings Festival, International Migratory Bird Day, 6th grade Forestry Tour, Youth Hunt BBQ, and various sportsmen shows. |
| | X | X | Develop a high school Walking Wetlands curriculum. |
| | X | X | Continue to offer teacher training workshops for each of the curricula. |
| | X | X | Construct a floating boardwalk next to education center on the permanent pond at Discovery Marsh. |
| | X | X | Create partnerships with schools to develop schoolyard habitat programs. |
| | X | X | Improve the education center by developing a permanent source of heat and electricity. |
| | X | X | Develop an outreach event on waterfowl identification for youth hunters. |
| | X | X | Develop a friends group. |

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| Objective 3.2 – Tule Lake Refuge – Provide high quality interpretive opportunities focused on Tule Lake Refuge and its wildlife during all seasons for up to 20,000 visitors a year. | | | |
| Rationale – The National Wildlife Refuge System Improvement Act of 1997 identifies interpretation as priority visitor uses for national wildlife refuges, along with hunting, fishing, wildlife observation, photography, and environmental education. In Refuge planning and management, priority uses take precedence over other potential visitor uses. The Service strives to provide priority visitor uses when compatible with the purpose(s) and goals of the Refuge and the mission of the National Wildlife Refuge System (System). Interpretation provides opportunities for visitors to make their own connections to refuge resources. By providing these opportunities, interpretation provokes participation in resource stewardship. It helps refuge visitors understand their relationships to, and impacts on, those resources. Interpretation is an important visitor activity at Tule Lake Refuge. Expanding interpretation opportunities on the Refuge would allow more visitors to experience, enjoy, and learn about native wildlife and plant species in the Klamath Basin and the Pacific Flyway. | | | |

| Alternative | | | Strategies |
|-------------|---|---|--|
| A | B | C | |
| X | X | X | Maintain public opportunities for nature interpretation via information kiosks, interpretive signs along auto-tour routes and nature trails, and visitor center. |
| X | X | X | Provide periodic nature interpretive programs for the public. |
| X | X | X | Provide brochures, maps, and visitor information to the public. |
| X | X | X | Ensure website contains current Refuge information. |
| | X | X | Provide additional interpretation about Walking Wetlands programs to the public. |
| | X | X | Provide hands-on exhibits in visitor center. |
| | X | X | Update visitor center entrance to be more visitor friendly. |
| | X | X | Update Refuge Complex Visitor Center to be ADA compliant. |
| | X | X | Update general brochures. |
| | | X | Develop a guided canoe interpretive program. |

Objective 3.3 – Tule Lake Refuge – Maintain adequate facilities and for visitors to observe, photograph, and enjoy the Refuge’s unique natural habitats and wildlife during all seasons of the year with a target of 25,000 visitor opportunities per year.

Rationale – The National Wildlife Refuge System Improvement Act of 1997 identifies wildlife observation and photography as priority visitor uses for national wildlife refuges, along with hunting, fishing, environmental education, and interpretation. In Refuge planning and management, priority uses take precedence over other potential visitor uses. The Service strives to provide priority visitor uses when compatible with the purpose(s) and goals of the Refuge and the mission of the National Wildlife Refuge System (System). Providing opportunities for visitors to observe and photograph wildlife can instill an appreciation for the value of and need for fish and wildlife habitat conservation and foster a sense of stewardship for the Refuge System. Wildlife viewing, nature observation, and wildlife photography are the primary visitor activities at Tule Lake Refuge. Expanding existing wildlife observation and photography opportunities on the Refuge would allow visitors to experience, enjoy, and learn about native wildlife and plant species in the Klamath Basin and the Pacific Flyway.

| Alternative | | | Strategies |
|-------------|---|---|--|
| A | B | C | |
| X | X | X | Maintain five existing photo blinds. |
| X | X | X | Maintain two hiking trails and two canoe trails. |
| X | X | X | Continue to offer free loaner canoes for visitors. |
| X | X | X | Maintain vehicle pull-offs, wildlife overlook and auto-tour route. |
| X | X | X | Maintain safe conditions and adequate law enforcement at all visitor facilities. |
| X | X | X | Continue to monitor visitor use of Refuge lands and adaptively manage as appropriate to ensure use remains compatible. |
| | X | X | Construct up to 4 pull-off areas on the existing auto tour route. |
| | | X | Modify auto tour route to maximize wildlife viewing opportunities. |
| | | X | Expand the Discovery Trail. |
| | | X | Improve/redesign the Sheepy Ridge Trail to decrease the slope, improve drainage, and reduce erosion. |

Objective 3.4 – Tule Lake Refuge – Maintain a high quality hunting program including opportunities for up to 5,000 annual hunting visits on up to 24,380 acres, depending on season length and climatic conditions.

Rationale – Hunting is a wildlife-dependent general public use of the Refuge System and, by law, is to be given special consideration in refuge planning and management. The Refuge System Administration Act

states that the Refuge System, "...was created to conserve fish, wildlife, and plants and their habitats and this conservation mission has been facilitated by providing Americans opportunities to participate in compatible wildlife-dependent recreation, including fishing and hunting, on System lands and to better appreciate the value of and need for fish and wildlife conservation." This Act goes on to state that the Refuge System is to provide increased, compatible opportunities, "...for parents and their children to safely engage in traditional outdoor activities, such as fishing and hunting...." As a wildlife-dependent public use, hunting can also reconnect people, including youth, with the natural world and help address nature-deficit disorder (Louv 2005). This potential would be furthered through implementation of youth waterfowl hunts on the Refuge.

Service policy states that hunting is, "...a healthy, traditional outdoor pastime, deeply rooted in the American heritage. Hunting can instill a unique understanding and appreciation of wildlife, their behavior, and their habitat needs." "Hunting programs can promote understanding and appreciation of natural resources and their management on lands and waters in the Refuge System" (Hunting, 605 FW 2). Service policy states that hunting is an appropriate use of the National Wildlife Refuge System (Appropriate Refuge Uses, 603 FW 1). The Refuge System Administration Act states that, "When managed in accordance with principles of sound fish and wildlife management and administration... [wildlife-dependent public uses, including hunting]...have been and are expected to continue to be generally compatible uses," and when determined compatible, quality hunting opportunities on refuges are to be facilitated, that is, strongly encouraged. Even if they find it objectionable, non-consumptive wildlife-dependent recreationists (e.g., those observing or photographing wildlife and those engaged in environmental interpretation) need to share the Refuge and its wildlife with visitors engaged in other compatible wildlife-dependent uses, including waterfowl hunting.

| Alternative | | | Strategies |
|-------------|---|---|--|
| A | B | C | |
| X | X | X | Continue to offer a diversity of waterfowl and pheasant hunting opportunities for sportsmen. |
| X | X | X | Maintain waterfowl only hunt areas; pheasant only hunt areas and joint waterfowl and pheasant hunting. |
| X | X | X | Maintain hunting opportunities via large free roam areas, lottery drawn spaced-blinds and lottery drawn open units. |
| X | X | X | Maintain hunt area accessibility via auto, motor boats, canoe style boats and walk- in. |
| X | X | X | Continue to offer hunt opportunities in a variety of habitats including flooded marsh, dry and flooded grain fields, and upland fields. |
| X | X | X | Continue to hold a post-season hunting meeting to gather concerns, suggestions, and other information about the hunt. Use the information gathered to make appropriate adjustments to improve the quality of the hunt program. |
| X | X | X | Maintain safe conditions and adequate law enforcement at all visitor facilities. |
| X | X | X | Continue to monitor visitor use of Refuge lands and adaptively manage as appropriate to ensure use remains compatible. |
| X | X | X | Maintain a hunt program consistent with California and Oregon State hunting dates and regulations. |
| X | | | Maintain existing hunting fee. |
| X | X | X | Continue to utilize advanced reservation system via lottery drawing on the opening weekend of the hunt season. |
| | X | X | Provide drive-in, boat-in wheelchair accessible hunting opportunities. |
| | X | X | Prepare a hunt plan which comprehensively evaluates Tule Lake Refuge hunt program, including: guide program (i.e., maintain, modify, or eliminate guide program); layout of hunt area and auto tour route (i.e., maintain or separate in time or space); and hunt fees (i.e., maintain or increase fee). |

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| | X | X | To reduce the likelihood that boats would contribute to invasive species problems on the Refuge, the Service would pursue partnerships with the states of California and Oregon to develop and operate a portable decontamination station(s) near boat launches on the Refuge and/or pursue other measures to address this concern. |
| | | X | Phase in a new requirement allowing only 4-stroke (4-cycle) boat motors to be used on the Refuge. |

Goal 4 – Protect, preserve, evaluate, and interpret the cultural heritage and resources of Tule Lake Refuge while consulting with appropriate Native American groups and preservation organizations, and complying with historic preservation legislation.

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| Objective 4.1 – Tule Lake Refuge – Implement a proactive cultural resources management program that focuses on meeting the requirements of the National Historic Preservation Act, including consultation, identification, inventory, evaluation, and protection of cultural resources. | | | |
| Rationale – Various federal historic preservation laws and regulations require the Service to implement the kind of program described under this objective. Inattention to these responsibilities may obstruct the Refuge in its other land, habitat, and wildlife management efforts. | | | |
| Alternative | | | Strategies |
| A | B | C | |
| X | X | X | Identify archaeological sites that coincide with existing and planned roads, facilities, public use areas, and habitat projects. Evaluate threatened and impacted sites for eligibility to the National Register of Historic Places. Prepare and implement activities to mitigate impacts to sites as necessary. |
| | X | X | Implement a program to evaluate eligibility to the National Register of Historic Places those archaeological sites that may be impacted by Service undertakings, management activities, erosion, or neglect. |
| | X | X | Develop a GIS layer for cultural resources that can be used with other GIS layers for the Refuge, yet contains appropriate locks to protect sensitive information. |
| | X | X | Develop partnerships with the Tribes for cultural resources inventory, evaluation, and project monitoring, consistent with the regulations of the National Historic Preservation Act. |
| | X | X | Perform an inventory and assessment of archaeological and historic sites to determine NRHP eligibility. As part of this inventory, identify specific stabilization and restoration costs. This should include prioritization of the most critical needs for each site and structure. |
| | X | X | Develop partnerships (e.g., University of Oregon, National Park Service, etc.) to assist in the stabilization and restoration of archaeological and historic sites and structures |

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| Objective 4.2 – Tule Lake Refuge – Develop, in partnership with the Klamath Tribes and other preservation partners, a program for the protection, education, and interpretation of cultural resources of Tule Lake Refuge. | |
| Rationale – Cultural resources are not renewable. Thus, interpretation of cultural resources can instill a conservation ethic among the public and others who encounter or manage them. The goals of the cultural resource education and interpretive program are fourfold: (1) translate the results of cultural research into media that can be understood and appreciated by a variety of people, (2) relate the connection between cultural resources and natural resources and the role of humans in the environment, (3) foster an awareness and appreciation of native cultures, and (4) instill an ethic for the conservation of our cultural heritage. | |
| Alternative | |

| A | B | C | Strategies |
|---|---|---|--|
| | X | X | Prepare interpretive media (e.g., pamphlets, signs, exhibits) that relate the cultural resources. |
| | X | X | Prepare environmental/cultural education materials for use in local schools and museums concerning cultural resources, the discipline of archaeology, the perspective of Native Americans, the history of the area, and conservation of natural and cultural resources. These materials could include an artifact replica kit with hands-on activities and curriculum prepared in consultation with the local school district, historical societies, and the Tribes. |
| | X | X | Consult with the Tribes, historical societies, and other preservation partners to identify the type of cultural resources information appropriate for public interpretation. |
| | X | X | Develop an outreach program and materials so that the cultural resource messages become part of cultural events in the area, including National Wildlife Refuge Week and appropriate local festivals. |
| | X | X | Develop Museum Property Inventory. Create storage and use plans for museum property as part of the outreach program. |

Objective 4.3 – Tule Lake Refuge – Create and utilize a Memorandum of Agreement with Native American groups to implement the inadvertent discovery clause of the Native American Graves Protection and Repatriation Act (NAGPRA).

Rationale – Development of a Memorandum of Agreement prior to an inadvertent discovery is strongly suggested by the NAGPRA implementing regulations. Such an agreement can greatly facilitate and speed up consultations as required by law after an inadvertent discovery.

| Alternative | | | Strategies |
|-------------|---|---|--|
| A | B | C | |
| | X | X | Identify Native American Tribes, Groups, and direct lineal descendants that may be affiliated with the Refuge lands. |
| | X | X | Open consultation process with affiliated Tribes, Groups, and direct lineal descendants. |
| | X | X | Define funerary objects, sacred objects and objects of cultural patrimony. |
| | X | X | Develop procedures to follow for intentional and inadvertent discoveries. |
| | X | X | Identify persons to contact for the purposes of NAGPRA. |

UPPER KLAMATH NATIONAL WILDLIFE REFUGE

Goal 1 – Restore and maintain the composition and structure of existing and historic wetland communities of Upper Klamath Lake to meet the needs of migratory waterfowl, waterbirds, and sensitive species.

| Objective 1.1 – Upper Klamath Refuge – Over the next 15 years, maintain Hank’s Marsh (approximately 1,191 acres) and Upper Klamath Marsh (13,775 acres) as seasonal and permanent marsh dominated by a diversity of emergent and submergent vegetation. | | |
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| Rationale – Upper Klamath Refuge wetlands are located immediately adjacent to Upper Klamath Lake. Thus, marsh water elevations are completely dependent on adjacent lake elevations which are managed by the Bureau of Reclamation. As such, active wetland management is limited on this refuge. Because this refuge has never been disturbed or otherwise reclaimed by human activities, active wetland enhancement actions are not envisioned for this refuge. Prescribed fire, a natural disturbance factor in this habitat, may be introduced in future years as a means of reducing emergent vegetation encroachment, at least on a short-term basis. | | |
| Monitoring elements: Breeding Canada Goose Pairs Survey, Breeding Duck Pairs Survey, Colonial Waterbirds Survey, Mid-Winter Waterfowl Survey, periodic waterfowl surveys, Secretive Marshbird Surveys | | |
| Alternative | | Strategies |
| A | B | |
| X | X | Wetland water elevation throughout Upper Klamath Refuge is dependent on the Reclamation Klamath Project. |
| X | X | Continue to scout, map, and control priority weed species with an emphasis on protecting high priority wildlife habitats. |
| X | X | Formalize ongoing pest management activities under an IPM program. |
| X | X | Develop program for managing berms to reduce invasive species cover and improve cover for nesting waterfowl and other species. |
| X | X | Use GPS to monitor weed populations. |
| X | X | Continue present program of managed cattle grazing and use of prescribed fire to maintain wetland and marsh habitats. |
| | X | Expand use of non-pesticide tools to control invasive species (e.g., grazing, restoration plantings). |
| | X | Prevent the introduction of aquatic invasive species by pursuing partnerships with the states of California and Oregon to develop and operate a portable decontamination station(s) near boat launches on the Refuge. |
| | X | Collaborate with adjoining landowners and other organizations to enhance and restore fringe wetland habitats on Upper Klamath Lake adjacent to Upper Klamath Refuge. |
| | X | Support implementation of recovery actions in the Revised Lost River Sucker and Shortnose Sucker Recovery Plan (Service 2012). |

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| Objective 1.2 – Upper Klamath Refuge – Within 10 years of implementation of this CCP, prepare and implement a plan to restore wetland habitat on the Barnes and Agency Lake Unit. |
| Rationale – Historically the Barnes and Agency Lake lands were shallow fringe wetlands adjacent to Upper Klamath and Agency Lakes. In the last 100+ years, the wetlands in this valley were drained and converted to irrigated agriculture. Since the 1940s, containment dikes were built to separate Agency and Barnes Ranches from the lakes and pump facilities were installed to drain the ground to facilitate |

livestock grazing. Additional canal and drainage features were built over time resulting in a complex network of canals, dikes, and gates.

Reclamation purchased Agency Ranch 1998. Reclamation and The Nature Conservancy purchased Barnes Ranch in 2006. Both ranches were used by Reclamation to facilitate pumped storage for expansion of water storage in Upper Klamath Lake. Both ranches were transferred to the Service as part of Upper Klamath Refuge in 2010. Reclamation ceased pumped storage operations in 2013.

The Service ultimately plans to restore wetlands on these acres and reconnect them with Upper Klamath and Agency Lakes. Currently the ranches are separated from Upper Klamath and Agency Lakes by large containment levees. The Service has done some preliminary planning for levee breaching options, but NEPA process has not yet commenced. Goals of the proposed restoration would be to:

- Reconnect fringe wetlands to Upper Klamath and Agency Lakes.
- Expand refugial habitat for shortnose and Lost River suckers.
- Potentially improve water quality in Upper Klamath Lake.
- Fully restore spring-fed Fourmile and Sevenmile Creeks to their historic channels, deliver clear cold water to Upper Klamath Lake, restore fish passage, and improve the important redband rainbow trout and potential bull trout and lamprey fisheries.
- Expand water storage in Upper Klamath Lake.
- Improve habitat for waterfowl

| Alternative | | Strategies |
|-------------|---|---|
| A | B | |
| | X | Develop and implement a plan and associated NEPA compliance for restoring riparian and wetland habitat on Barnes-Agency Unit. Options include re-contouring lake bed, re-establishing braided delta channels, reaching the exterior levees and reconnecting 15,000 acres of delta wetlands (open water, submergent, emergent, and seasonal fringe) to Upper Klamath and Agency Lakes. |
| | X | Work with willing adjacent landowners to negotiate an easement that allows for flood inundation on adjacent private properties. |
| | X | Collaborate with BLM to integrate subsidence reversal. |

Objective 1.3 – Upper Klamath Refuge – Until long term restoration of the property is planned and implemented, maintain the Barnes-Agency Unit as wet meadow dominated by perennial grasses, sedges and rushes to provide green browse for spring migrating waterfowl.

Rationale – The Intermountain West Joint Venture (IWJV) developed a scientifically-based and defensible habitat objective for this unique wet meadow habitat type that involves conserving 64,700 acres to meet the needs of spring migrating waterfowl at North American Waterfowl Management Plan (NAWMP) goal levels (IWJV 2013[Implementation Plan]).

Properly managed grazing can be important management tool for maintaining a healthy wet meadow community. Periodic disturbance to sedge communities is necessary to reduce non-native reed canary grass and revitalize existing sedge plants by removing an accumulation of dead vegetation. These vegetation treatments also provide important spring migration habitat by providing short and new-growth sedge vegetation structure that is used for loafing and feeding by a variety of waterbird species. Although not all-inclusive, other bird species benefiting from the conservation of sedge meadows include common snipe, marsh wren, black tern American bittern, sora and Virginia rail.

Monitoring elements: Periodic waterfowl surveys

| Alternative | | Strategies |
|-------------|---|--|
| A | B | |
| X | X | Use prescribed fire, haying, and grazing to improve habitat structure and provide green browse for migrating waterfowl (dabbling ducks and geese). |
| | X | Using grazing opportunities on Barnes-Agency Unit to provide incentive for private landowners to develop wetlands on their property. |

Goal 2 – Provide a range of wildlife dependent recreational opportunities that emphasize the natural setting and the functions of the Upper Klamath Refuge.

Objective 2.1 – Upper Klamath Refuge – Provide on-site Refuge specific curriculum to at least 500 students annually and off-site Refuge specific curriculum and outreach at a minimum of 6 special events annually.

Rationale – Environmental education is one of the six priority public uses of the Refuge system and should be fostered if compatible with the Refuge purpose and Refuge System mission. Interpreting the resources and challenges of the Refuge to the public and incorporating these topics into school curricula are important ways to influence the future well-being of the Refuge and the Klamath Basin resources. Environmental education can instill an appreciation for the value of and need for fish and wildlife habitat conservation. Upper Klamath Refuge is in a unique position to offer education agencies, teachers, and students an opportunity to study natural resource management and conservation issues in a remote outdoor setting. The importance of utilizing Refuges as outdoor classrooms to promote wildlife conservation is a growing initiative for the Service. Developing and providing a limited number of educational programs or outreach events will support the Service’s goals and promote an understanding of the importance of Upper Klamath Refuge to the National Wildlife Refuge System and to the regional ecosystem.

| Alternative | | Strategies |
|-------------|---|---|
| A | B | |
| X | | Continue to provide limited field trips upon request to the Refuge and bordering U.S. Forest Service lands. |
| | X | Collaborate with U.S. Forest Service to provide educational programs on-site and around the Refuge year-round. |
| | X | Provide outreach at special events which could include but not limited to: Winter Wings Festival, International Migratory Bird Day, 6th grade Forestry Tour, Youth Hunt BBQ, and various sportsmen shows. |

Objective 2.2 – Upper Klamath Refuge – Provide high quality interpretive opportunities focused on Upper Klamath Refuge and its wildlife during all seasons for up to 2,500 visitors a year

Rationale – Interpretation is also one of the six priority public uses of the Refuge system that should be fostered if compatible with the Refuge purpose and Refuge System mission. Interpretation provides opportunities for visitors to make their own connections to refuge resources. By providing these opportunities, interpretation provokes participation in resource stewardship. It helps refuge visitors understand their relationships to, and impacts on, those resources. Interpretation is an important visitor activity at Tule Lake Refuge. Improving existing interpretative facilities would allow visitors to garner an understanding of why the Refuge was established, what the Refuge provides, how it contributes ecologically to the regional landscape, and how it links to the rest of the Refuge system.

| Alternative | | Strategies |
|-------------|---|--|
| A | B | |
| X | X | Continue to provide canoe trail maps and brochures at the Refuge headquarters and Rocky Point Resort. |
| X | X | Continue to provide a canoe trail map and interpretive signs at Rocky Point and Malone Springs boat launch. |
| | X | Collaborate with U.S. Forest Service & BLM to provide interpretation about the Refuge, specifically the Barnes-Agency Unit, which borders the Wood River Wetlands. |
| | X | Provide a seasonal contact station to provide maps, brochures, and other information. |
| | X | Develop a more permanent solution to having a seasonal point of contact during peak visitation. |
| | X | Install interpretive signs along the canoe trail. |
| | X | Install an interpretive kiosk on West Side Road at a pull-off. |
| | X | Provide 4 seasonal field trips to the Refuge to lead canoe tours. |

Objective 2.3 – Upper Klamath Refuge – Maintain adequate facilities and for visitors to observe, photograph, and enjoy the Refuge’s unique natural habitats and wildlife during all seasons of the year with a target of 3,000 visitor opportunities per year.

Rationale – The National Wildlife Refuge System Improvement Act of 1997 identifies wildlife observation and wildlife photography as priority visitor uses for national wildlife refuges, along with hunting, fishing, and environmental education. In Refuge planning and management, priority uses take precedence over other potential visitor uses. The Service strives to provide priority visitor uses when compatible with the purpose(s) and goals of the Refuge and the mission of the National Wildlife Refuge System. Expanding existing wildlife observation and photography opportunities on the Refuge would allow visitors to experience, enjoy, and learn about native wildlife and plant species in the Klamath Basin and the Pacific Flyway.

| Alternative | | Strategies |
|-------------|---|---|
| A | B | |
| X | X | Continue providing opportunities for wildlife observation and photography by maintaining a canoe trail through the wetland. |
| | X | Create a pull-off on West Side Road for views of the Refuge. |
| X | X | Maintain safe conditions and adequate law enforcement at all visitor facilities. |
| X | X | Continue to monitor visitor use of Refuge lands and adaptively manage as appropriate to ensure use remains compatible. |

Objective 2.4 – Upper Klamath Refuge – Maintain a high quality hunting program including opportunities for up to 250 annual hunting visits on up to 24,380 acres, depending on season length and climatic conditions.

Rationale – Hunting is a wildlife-dependent general public use of the Refuge System and, by law, is to be given special consideration in refuge planning and management. The Refuge System Administration Act states that the Refuge System, “...was created to conserve fish, wildlife, and plants and their habitats and this conservation mission has been facilitated by providing Americans opportunities to participate in compatible wildlife-dependent recreation, including fishing and hunting, on System lands and to better appreciate the value of and need for fish and wildlife conservation.” This Act goes on to state that the Refuge System is to provide increased, compatible opportunities, “...for parents and their children to safely engage in traditional outdoor activities, such as fishing and hunting....” As a wildlife-dependent public use, hunting can also reconnect people, including youth, with the natural world and help address nature-deficit disorder (Louv 2005). This potential would be furthered through implementation of youth

waterfowl hunts on the Refuge.

Service policy states that hunting is, "...a healthy, traditional outdoor pastime, deeply rooted in the American heritage. Hunting can instill a unique understanding and appreciation of wildlife, their behavior, and their habitat needs." "Hunting programs can promote understanding and appreciation of natural resources and their management on lands and waters in the Refuge System" (Hunting, 605 FW 2). Service policy states that hunting is an appropriate use of the National Wildlife Refuge System (Appropriate Refuge Uses, 603 FW 1). The Refuge System Administration Act states that, "When managed in accordance with principles of sound fish and wildlife management and administration... [wildlife-dependent public uses, including hunting]...have been and are expected to continue to be generally compatible uses," and when determined compatible, quality hunting opportunities on refuges are to be facilitated, that is, strongly encouraged. Even if they find it objectionable, non-consumptive wildlife-dependent recreationists (e.g., those observing or photographing wildlife and those engaged in environmental interpretation) need to share the Refuge and its wildlife with visitors engaged in other compatible wildlife-dependent uses, including waterfowl hunting.

| Alternative | | Strategies |
|-------------|---|--|
| A | B | |
| X | X | Maintain a diversity of waterfowl hunting opportunities for sportsmen. |
| X | X | Maintain hunting opportunities via large free roam areas. |
| X | X | Maintain hunt area accessibility via motor boats, canoe style boats and walk- in. |
| X | X | No hunting fee required. |
| X | X | Continue to offer hunt opportunities in a variety of habitats including flooded marsh, dry and flooded grain fields, and upland fields. |
| X | X | Continue to hold a post-season hunting meeting to gather concerns, suggestions, and other information about the hunt. Use the information gathered to make appropriate adjustments to improve the quality of the hunt program. |
| X | X | Maintain safe conditions and adequate law enforcement at all visitor facilities. |
| X | X | Continue to monitor visitor use of Refuge lands and adaptively manage as appropriate to ensure use remains compatible. |
| X | X | Maintain a hunt program consistent with Oregon State hunting dates and regulations. |
| | X | Consider opening tracks on the Barnes-Agency Unit to hunting until long-term restoration of these areas is implemented. |

Objective 2.5 – Upper Klamath Refuge – Continue to provide quality fishing opportunities on approximately 1,400 acres for up to 5,000 visitors each year.

Rationale – Fishing is one of the six priority public uses identified in the National Wildlife System Improvement Act of 1997 and is to be facilitated when compatible with the purposes of the Refuge and the mission of the Refuge System. Service policy states that, "Fishing programs promote understanding and appreciation of natural resources and their management on all lands and waters of the Refuge System (605 FW3). The Refuge System Administration Act states that the Refuge System, "...was created to conserve fish, wildlife, and plants and their habitats and this conservation mission has been facilitated by providing Americans opportunities to participate in compatible wildlife-dependent recreation, including fishing..., on System lands and to better appreciate the value of and need for fish and wildlife conservation." This Act goes on to state that the Refuge System is to provide increased, compatible opportunities, "...for parents and their children to safely engage in traditional outdoor activities, such as fishing...."

Service policy and Federal law require that wildlife-dependent public uses (including fishing) be given special consideration in refuge planning and management, and opportunities to allow these uses are to be

considered in each refuge CCP (605 FW 1) and NWRS Administration Act). When determined compatible on a refuge-specific basis, a wildlife-dependent use becomes a priority public use for that refuge and is to be facilitated, that is, strongly encouraged.

By facilitating this use on the Refuge, the Service strives to increase the visitors' knowledge and appreciation of fish and wildlife, which may lead to increased public stewardship of wildlife and their habitats on the Refuge. Increased public stewardship will support and complement the Service's actions in achieving the Refuge's purposes and the mission of the National Wildlife Refuge System.

For the purposes of this objective, a quality fishing experience means that anglers are safe, anglers exhibit high standards of ethical behavior, anglers are provided with uncrowded conditions, anglers are clear on which areas are open and closed to fishing, and minimal conflicts occur between anglers and other visitors.

| Alternative | | Strategies |
|-------------|---|---|
| A | B | |
| X | X | Maintain a diversity of fishing opportunities for anglers. |
| X | X | Continue to permit fishing in Pelican Bay, Recreation Creek, Crystal Creek, Odessa Creek, Pelican Cut and that portion of Upper Klamath Lake located on the west side of the Refuge. |
| X | X | Manage fishing opportunities in accordance with Oregon State and federal refuge specific regulation. |
| X | X | Maintain a 10 miles per hour speed limit for motorized boats in any stream, creek or canal and on that portion of Pelican Bay west of a line beginning at designated points on the north shore of Pelican Bay one-fourth mile east of Crystal Creek and extending due south to the opposite shore of the lake. |
| X | X | Only the use of pole and line or rod and reel is permitted. |
| X | X | Continue to work with the U.S. Forest Service (that operates the Rocky Point and Malone Springs boat launches) and the Oregon Department of Natural Resources to cooperatively manage the Refuge lands and waters within Upper Klamath Lake to allow recreational use of Upper Klamath Lake while ensuring protection of native fish, wildlife, and their habitats; and allow enforcement of Refuge regulations within Refuge boundaries. |
| X | X | Maintain safe conditions and adequate law enforcement at all visitor facilities. |
| X | X | Continue to monitor visitor use of Refuge lands and adaptively manage as appropriate to ensure use remains compatible. |
| | X | To reduce the likelihood that boats would contribute to invasive species problems on the Refuge, the Service would pursue a partnership with the U.S. Forest Service and the State of Oregon to develop and operate a portable decontamination station near boat launches. |

Goal 3 – Manage, conserve, evaluate, and interpret the cultural heritage and resources of Upper Klamath Refuge while consulting with appropriate Native American groups and preservation organizations, and complying with historic preservation legislation.

Objective 3.1 – Upper Klamath Refuge – Implement a proactive cultural resources management program that focuses on meeting the requirements of the National Historic Preservation Act, including consultation, identification, inventory, evaluation, and protection of cultural resources.

Rationale – Various federal historic preservation laws and regulations require the Service to implement the kind of program described under this objective. Inattention to these responsibilities may obstruct the Refuge in its other land, habitat, and wildlife management efforts.

| Alternative | | Strategies |
|-------------|---|--|
| A | B | |
| X | X | Identify archaeological sites that coincide with existing and planned roads, facilities, public use areas, and habitat projects. Evaluate threatened and impacted sites for eligibility to the National Register of Historic Places. Prepare and implement activities to mitigate impacts to sites as necessary. |
| | X | Implement a program to evaluate eligibility to the National Register of Historic Places those archaeological sites that may be impacted by Service undertakings, management activities, erosion, or neglect. |
| | X | Develop a GIS layer for cultural resources that can be used with other GIS layers for the Refuge, yet contains appropriate locks to protect sensitive information. |
| | X | Develop partnerships with the Tribes for cultural resources inventory, evaluation, and project monitoring, consistent with the regulations of the National Historic Preservation Act. |
| | X | Perform an inventory and assessment of archaeological and historic sites to determine NRHP eligibility. As part of this inventory, identify specific stabilization and restoration costs. This should include prioritization of the most critical needs for each site and structure. |
| | X | Develop partnerships (e.g., University of Oregon, National Park Service, etc.) to assist in the stabilization and restoration of archaeological and historic sites and structures. |

Objective 3.2 – Upper Klamath Refuge – Develop, in partnership with the Klamath Tribes and other preservation partners, a program for the protection, education, and interpretation of cultural resources of the Refuge Complex.

Rationale – Cultural resources are not renewable. Thus, interpretation of cultural resources can instill a conservation ethic among the public and others who encounter or manage them. The goals of the cultural resource education and interpretive program are fourfold: (1) translate the results of cultural research into media that can be understood and appreciated by a variety of people, (2) relate the connection between cultural resources and natural resources and the role of humans in the environment, (3) foster an awareness and appreciation of native cultures, and (4) instill an ethic for the conservation of our cultural heritage.

| Alternative | | Strategies |
|-------------|---|--|
| A | B | |
| | X | Prepare interpretive media (e.g., pamphlets, signs, exhibits) that relate the cultural resources. |
| | X | Prepare environmental/cultural education materials for use in local schools and museums concerning cultural resources, the discipline of archaeology, the perspective of Native Americans, the history of the area, and conservation of natural and cultural resources. These materials could include an artifact replica kit with hands-on activities and curriculum prepared in consultation with the local school district, historical societies, and the Tribes. |
| | X | Consult with the Tribes, historical societies, and other preservation partners to identify the type of cultural resources information appropriate for public interpretation. |
| | X | Develop an outreach program and materials so that the cultural resource messages become part of cultural events in the area, including National Wildlife Refuge Week and appropriate local festivals. |
| | X | Develop Museum Property Inventory. Create storage and use plans for museum property as part of the outreach program. |

| Objective 3.3 – Upper Klamath Refuge – Create and utilize a Memorandum of Agreement with Native American groups to implement the inadvertent discovery clause of the Native American Graves Protection and Repatriation Act (NAGPRA). | | |
|--|----------|--|
| Rationale – Development of a Memorandum of Agreement prior to an inadvertent discovery is strongly suggested by the NAGPRA implementing regulations. Such an agreement can greatly facilitate and speed up consultations as required by law after an inadvertent discovery. | | |
| Alternative | | Strategies |
| A | B | |
| | X | Identify Native American Tribes, Groups, and direct lineal descendants that may be affiliated with the Refuge lands. |
| | X | Open consultation process with affiliated Tribes, Groups, and direct lineal descendants. |
| | X | Define funerary objects, sacred objects and objects of cultural patrimony. |
| | X | Develop procedures to follow for intentional and inadvertent discoveries. |
| | X | Identify persons to contact for the purposes of NAGPRA. |

BEAR VALLEY NATIONAL WILDLIFE REFUGE

Goal 1 – Promote open stands of ponderosa pine with grass understory to restore historic fire regime.

Objective 1.1 – Bear Valley Refuge – Over the next 15 years, maintain existing ponderosa pine stands with the following characteristics:

1. >10 trees/ac >21 in diameter at breast height (dbh), and at least 2 of the trees >31 in dbh
2. >1.4 snags/ac >8 in dbh with 50% >25 in dbh in a moderate to advanced state of decay.
3. 20-60% cover in the shrub layer (includes shrubs and small trees) and >20% of the shrub layer in regenerating sapling conifers, especially pines
4. Where appropriate, maintain contiguous blocks of 350 (primarily old growth) to 700 acres (mixed old growth and younger stands).
5. Mean canopy cover 10-30%

Rationale – In the Pacific Northwest, heterogeneous, multi-layered stands of mature or old growth coniferous forest with numerous spike top trees and snags are preferred nesting and roosting sites for bald eagles. Bear Valley National Wildlife Refuge was established to protect this type of eagle roost habitat in close proximity to abundant food resources on Lower Klamath and Tule Lake Refuges.

The open condition of historic Ponderosa pine stands is now relatively rare and has led to declines in numerous wildlife species, including deer and elk, in addition to entire guilds of landbirds. The following narrative briefly describes bird communities within this habitat type (from Altman (2000)):

“We considered approximately 85 native landbird species to be regularly associated breeding species in Ponderosa pine habitats. Several species are obligate or near obligate to this habitat type such that they are rarely found in other forest types in Oregon and Washington. These include pygmy nuthatch and white-headed woodpecker. Other regularly associated species include flammulated owl, Williamson’s sapsucker, Lewis’ woodpecker, Townsend’s solitaire, chipping sparrow, and white-breasted nuthatch.”

“Because of the extensive loss of Ponderosa pine forest, habitat restoration is the most important strategy for conservation of landbirds associated with this habitat type. The desired condition in Ponderosa pine forest is a large tree, single-layered canopy with an open, park-like understory dominated by herbaceous cover with scattered shrub cover and pine regeneration” (Altman 2000).

In addition to restoring historic conditions and associated wildlife habitats, the goal within these stands is to reduce fuel loadings and fire danger, recycle nutrients currently tied up in dead biomass, reduce density-related stress on remnant old growth trees, and re-invigorate grasses and shrubs by reintroducing fire and/or mechanical treatment to the site. In short, to return these stands to a more open condition dominated by large Ponderosa pine.

Past fire suppression in the Bear Valley region has generally converted many stands from fire resistant, open-grown ponderosa pine to relatively dense stands of fire intolerant white fir, Douglas fir, and incense cedar. White fir is a less desirable roost tree species for two reasons. It develops poor roost-tree characteristics because it has relatively fine branches and dense tree crowns, and is thus less desirable to eagles. White fir encroachment also appears to preclude regeneration of more desirable roost tree species. Overstocking in many stands, particularly with white fir saplings, coupled with excessive dead and down material has rendered the bear valley roost highly susceptible to catastrophic wildfire. In addition to increasing the risk of catastrophic fire, overstocking of timber stands stresses trees leaving them more susceptible to forest pathogens and insect attack and is a threat to the long-term health of many timber stands on the refuge.

A variety of habitat management activities has been implemented on the refuge to resolve these issues, including selective thinning, slash-busting, hand thinning, and prescribed fire. Selective thinning involves the removal of selected trees to reduce overall tree density and promote the recruitment of tree species favored by bald eagles. The work is usually conducted under contract in a timber sale. Slash-busting is a method to reduce fuel loads by use of a rapid spinning steel disk with teeth or spikes that grind, tear, and slash brush, trees, and natural fuel litter into small pieces. Hand thinning involves the use of handheld power chain saws, human operated pole saws, pruners, clippers, loppers, or other hand tools to reduce fuel loads. Prescribed burning uses fire applied to predetermined areas, under specific environmental conditions, to remove and reduce unwanted fuels such as brush, timber, grass, and logging slash.

In an effort to reduce the risk of catastrophic wildfire destroying vital nesting and roosting resources or spreading into the communities bordering the refuge, thousands of refuge acres have been subjected to hazardous fuels reducing treatments through thinning and prescribed burning. Since 1999, approximately 50 to 55% of Bear Valley Refuge has experienced some form of fuels reduction treatments. In 1999, a timber sale was administered in the central area of the refuge, followed by hand thinning with chainsaws and pruners. A slash-busting contract started in 2003 to remove unwanted western junipers competing with the bald eagle-preferred ponderosa pines and Douglas firs. Additional hand thinning projects progressed across the refuge, and a second timber sale was completed in 2004. The sale permitted pre-selected/marked trees to be removed, in turn opening up the canopy, reducing smaller, unhealthy trees, and encouraging larger trees to grow. Prescribed fire, used primarily to burn piles over the past few years, was returned on a larger broadcast scale in fall 2005. Current air quality standards in the Klamath Falls area have reduced opportunities for prescribed burns in the refuge, because burning is restricted to days when winds will not allow for smoke to impact the non-attainment area. A third timber sale was completed in 2011. Additional slash-busting and hand thinning projects along with more than 1,000 acres of prescribed burning are also planned. Future slash-busting, thinning and prescribed fire projects will be necessary to restore and maintain the refuge to a fire resilient condition.

Monitoring Indicators: bald eagle nesting survey (March-May), bald eagle roosting (Nov-Feb)

| Alternative | | Strategies |
|-------------|---|--|
| A | B | |
| X | X | Continue present program of prescribed fire and understory mowing to reduce fuel loading, promote fire resistant conifer species, and allow forested habitats to develop old growth and mature forest characteristics. |
| X | | Forested habitats are primarily managed as winter roosting habitat for bald eagles. |
| | X | Evaluate potential to manage forests for a wider array of wildlife species while continuing to promote old growth and mature forest characteristics. |
| | X | Evaluate need for future silvicultural thinning to achieve desired habitat characteristics. |
| | X | Formalize pest management practices under an IPM program. |
| | X | Develop wildlife inventory and monitoring plan which would include all priority wildlife species (in addition to bald eagles). |

Goal 2 – Maintain existing areas of late successional forest conditions and actively manage to promote sustainability of this forest type.

Objective 2.1 – Bear Valley Refuge – Over the next 15 years, maintain mixed conifer forest stands with the following characteristics:

1. > 4 trees/ac > 18 in dbh with at least 2 trees > 24 in dbh
2. > 1 snag/ac > 12 in dbh (ponderosa pine should be >18 in dbh)

| | | |
|---|----------|---|
| 3. > 8 trees/ac) >21 in dbh to function as recruitment snags 4. Mean canopy cover 25-70% 5. Some brushy thickets of sapling/pole trees for roosting habitat | | |
| <p>Rationale – In the Pacific Northwest, heterogeneous, multi-layered stands of mature or old growth coniferous forest with numerous spike top trees and snags are preferred nesting and roosting sites for bald eagles. Bear Valley Refuge was established to protect this type of eagle roost habitat. Altman, (2000) describes the bird communities found in the mixed conifer forest:</p> <p>“We considered approximately 85 native landbird species to be regularly associated breeding species in Mixed Conifer (late-successional) habitats. Principal species associated with this habitat type include pileated woodpecker, northern goshawk, brown creeper, olive-sided flycatcher, Hammond's flycatcher, Vaux's swift, blue grouse, golden-crowned kinglet, and varied thrush.”</p> <p>“The desired condition in Mixed Conifer (Late-Successional) forest is a multilayered old forest with a diversity of structural elements (e.g., snags, dense shrub patches, high canopy closure) in patches across the landscape.” Douglas fir and ponderosa pine are preferred roost trees of bald eagles because of the openness of their crowns and large size. While white fir which has encroached over time is much less desirable because it has much finer, smaller branches and dense crowns that are not suitable for perching bald eagles (Altman 2000).</p> <p>In addition to restoring historic conditions and associated wildlife habitats, the goal within these stands is similar to that in Ponderosa pine stands which is to reduce fuel loadings and fire danger, recycle nutrients currently tied up in dead biomass and reduce density-related stress on remnant old growth trees by reintroducing fire and/or mechanical treatment to the site.</p> | | |
| Monitoring Indicators: bald eagle nesting survey (March-May), bald eagle roosting (Nov-Feb) | | |
| Alternative | | Strategies |
| A | B | |
| X | X | Continue present program of prescribed fire and understory mowing to reduce fuel loading, promote fire resistant conifer species, and allow forested habitats to develop old growth and mature forest characteristics. |
| X | | Manage forested habitats primarily as winter roosting habitat for bald eagles. |
| | X | Evaluate potential to manage forests for a wider array of wildlife species while continuing to promote old growth and mature forest characteristics. |
| | X | Evaluate need for future silvicultural thinning to achieve desired habitat characteristics. |
| | X | Formalize pest management practices under an IPM program. |
| | X | Develop wildlife inventory and monitoring plan which would include all priority wildlife species (in addition to bald eagles). |
| | X | Coordinate with partners that are leading efforts to assess the effects of climate change on the rate of snag creation and deterioration, and development of snag retention guidelines to benefit tree cavity-dependent wildlife. |

Goal 3 – Restore riparian habitats along the length of Bear Creek with an emphasis on aspen and willow establishment.

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| <p>Objective 3.1 – Bear Valley Refuge –Within 5 years of implementation of this CCP, develop and implement a plan to restore and manage aspen and willow stands along the length of Bear Creek through the refuge to benefit riparian dependent landbirds such as red-naped sapsucker, yellow-breasted chat, and willow flycatcher</p> |
| <p>Rationale – Altman and Holmes, (2000) describe the bird communities found in riparian habitats:</p> |

“We considered approximately 97 native landbird species to be highly associated breeding species in riparian habitats. In contrast to shrub-steppe, riparian habitat typically supports the greatest diversity of landbird species. As with shrub-steppe, there are several species dependent on this habitat type in the Columbia Plateau (e.g., western wood-pewee, Bullock’s oriole, willow flycatcher, yellowbreasted chat, yellow-billed cuckoo, yellow warbler). However, most of these species also occur in riparian habitat elsewhere in Oregon and Washington.”

Several aspen stands are found along Bear Creek at the north and south ends of the creek within the refuge. Between the two sites little riparian vegetation exists, and large ponderosa pines are pre dominate along most of the stream edge. In order for aspen and willows to become established along the creek the pines that shade the riparian area will need to be removed or greatly thinned since aspen and willows need full sunlight to grow.

| Alternative | | Strategy |
|-------------|---|---|
| A | B | |
| | X | Develop and implement a plan to restore and maintain riparian habitats along Bear Valley Creek to optimized use by priority species as identified in the Partners in Flight East Slope Cascades Plan. |

Goal 4 – Wildlife Dependent Recreation: Provide a range of wildlife dependent recreational opportunities that emphasize the natural setting and the functions of the Bear Valley Refuge.

Objective 4.1 – Bear Valley Refuge – Provide on-site Refuge specific curriculum to at least 500 students annually and off-site Refuge specific curriculum and outreach at a minimum of 6 special events annually.

Rationale – Environmental education is one of the six priority public uses of the Refuge system and should be fostered if compatible with the Refuge purpose and Refuge System mission. Interpreting the resources and challenges of the Refuge to the public and incorporating these topics into school curricula are important ways to influence the future well-being of the Refuge and the Klamath Basin resources. Environmental education can instill an appreciation for the value of and need for fish and wildlife habitat conservation. Developing and providing a limited number of educational programs or outreach events will support the Service’s goals and promote an understanding of the importance of Bear Valley Refuge to the National Wildlife Refuge System and to the regional ecosystem.

| Alternative | | Strategies |
|-------------|---|--|
| A | B | |
| X | X | Maintain K-12 curriculum about wintering Bald Eagle biology. |
| X | X | Continue to participate in annual Winter Wings Festival in Klamath Falls. |
| | X | Develop and provide educational field trips on-site that highlight refuge forest management practices. |

Objective 4.2 – Bear Valley Refuge – Provide high quality wildlife observation, photography, and interpretive opportunities focused on Bear Valley Refuge and its wildlife during all seasons for up to 5,000 visitors a year

Rationale – The National Wildlife Refuge System Improvement Act of 1997 identifies wildlife observation, wildlife photography, and interpretation as priority visitor uses for national wildlife refuges, along with hunting, fishing, and environmental education. In Refuge planning and management, priority uses take precedence over other potential visitor uses. The Service strives to provide priority visitor uses when compatible with the purpose(s) and goals of the Refuge and the mission of the National Wildlife Refuge System (System). Providing opportunities for visitors to observe and photograph wildlife can instill an appreciation for the value of and need for fish and wildlife habitat conservation and foster a sense of stewardship for the Refuge System. Bear Valley Refuge currently is currently closed to wildlife

observation and photography and no interpretive signs exist on site. Improving existing facilities would allow visitors to gain an understanding of why the Refuge was established, what the Refuge provides, how it contributes to the regional landscape, and how it links to the rest of the Refuge system.

| Alternative | | Strategies |
|-------------|---|---|
| A | B | |
| X | | Refuge closed to wildlife observation and photography. |
| X | X | Maintain public opportunities for nature interpretation via media at Refuge Complex Headquarters Refuge Complex Website. |
| | X | Explore new opportunities for wildlife observation and photography (e.g., viewing area at the south entrance for bald eagle viewing). |
| | X | Explore opportunities to develop and present interpretive programs and associated facilities on-site. |
| | X | Install additional directional and boundary signs. |
| X | X | Maintain safe conditions and adequate law enforcement at all visitor facilities. |
| | X | Monitor visitor use of Refuge lands and adaptively manage as appropriate to ensure use remains compatible. |

Objective 4.3 – Bear Valley Refuge – Maintain a limited, high quality deer hunting program including opportunities for up to 100 hunting visits on up to 4,200 acres.

Rationale – Hunting is a wildlife-dependent general public use of the Refuge System and, by law, is to be given special consideration in refuge planning and management. The Refuge System Administration Act states that the Refuge System, “...was created to conserve fish, wildlife, and plants and their habitats and this conservation mission has been facilitated by providing Americans opportunities to participate in compatible wildlife-dependent recreation, including fishing and hunting, on System lands and to better appreciate the value of and need for fish and wildlife conservation.” This Act goes on to state that the Refuge System is to provide increased, compatible opportunities, “...for parents and their children to safely engage in traditional outdoor activities, such as fishing and hunting....” As a wildlife-dependent public use, hunting can also reconnect people, including youth, with the natural world and help address nature-deficit disorder (Louv 2005).

| Alternative | | Strategies |
|-------------|---|--|
| A | B | |
| X | X | Continue to offer State-managed deer hunt on Refuge, consistent with Oregon State season dates and regulations. |
| X | X | Maintain walk-in only hunting opportunities. |
| | X | Establish parking for designated hunting access points on the north and south of Bear Valley Refuge. |
| X | X | Maintain safe conditions and adequate law enforcement at all visitor facilities. |
| X | X | Continue to monitor visitor use of Refuge lands and adaptively manage as appropriate to ensure use remains compatible. |
| | X | Revise deer hunt to require non-toxic ammunition. |
| | X | Prepare new hunt plan which evaluates additional hunting opportunities. |

Goal 5 – Manage, conserve, evaluate, and interpret the cultural heritage and resources of Bear Valley Refuge while consulting with appropriate Native American groups and preservation organizations, and complying with historic preservation legislation.

| Objective 5.1 – Bear Valley Refuge – Implement a proactive cultural resources management program that focuses on meeting the requirements of the National Historic Preservation Act, including consultation, identification, inventory, evaluation, and protection of cultural resources. | | |
|--|---|--|
| Rationale – Various federal historic preservation laws and regulations require the Service to implement the kind of program described under this objective. Inattention to these responsibilities may obstruct the Refuge in its other land, habitat, and wildlife management efforts. | | |
| Alternative | | Strategies |
| A | B | |
| X | X | Identify archaeological sites that coincide with existing and planned roads, facilities, public use areas, and habitat projects. Evaluate threatened and impacted sites for eligibility to the National Register of Historic Places. Prepare and implement activities to mitigate impacts to sites as necessary. |
| | X | Implement a program to evaluate eligibility to the National Register of Historic Places those archaeological sites that may be impacted by Service undertakings, management activities, erosion, or neglect. |
| | X | Develop a GIS layer for cultural resources that can be used with other GIS layers for the Refuge, yet contains appropriate locks to protect sensitive information. |
| | X | Develop partnerships with the Tribes for cultural resources inventory, evaluation, and project monitoring, consistent with the regulations of the National Historic Preservation Act. |
| | X | Perform an inventory and assessment of archaeological and historic sites to determine NRHP eligibility. As part of this inventory, identify specific stabilization and restoration costs. This should include prioritization of the most critical needs for each site and structure. |
| | X | Develop partnerships (e.g., University of Oregon, National Park Service, etc.) to assist in the stabilization and restoration of archaeological and historic sites and structures. |

| Objective 5.2 – Bear Valley Refuge – Develop, in partnership with the Klamath Tribes and other preservation partners, a program for the protection, education, and interpretation of cultural resources of the Refuge Complex. | | |
|--|---|--|
| Rationale – Cultural resources are not renewable. Thus, interpretation of cultural resources can instill a conservation ethic among the public and others who encounter or manage them. The goals of the cultural resource education and interpretive program are fourfold: (1) translate the results of cultural research into media that can be understood and appreciated by a variety of people, (2) relate the connection between cultural resources and natural resources and the role of humans in the environment, (3) foster an awareness and appreciation of native cultures, and (4) instill an ethic for the conservation of our cultural heritage. | | |
| Alternative | | Strategies |
| A | B | |
| | X | Prepare interpretive media (e.g., pamphlets, signs, exhibits) that relate the cultural resources. |
| | X | Prepare environmental/cultural education materials for use in local schools and museums concerning cultural resources, the discipline of archaeology, the perspective of Native Americans, the history of the area, and conservation of natural and cultural resources. These materials could include an artifact replica kit with hands-on activities |

| | | |
|--|---|---|
| | | and curriculum prepared in consultation with the local school district, historical societies, and the Tribes. |
| | X | Consult with the Tribes, historical societies, and other preservation partners to identify the type of cultural resources information appropriate for public interpretation. |
| | X | Develop an outreach program and materials so that the cultural resource messages become part of cultural events in the area, including National Wildlife Refuge Week and appropriate local festivals. |
| | X | Develop Museum Property Inventory. Create storage and use plans for museum property as part of the outreach program. |

Objective 5.3 – Bear Valley Refuge – Create and utilize a Memorandum of Agreement with Native American groups to implement the inadvertent discovery clause of the Native American Graves Protection and Repatriation Act (NAGPRA).

Rationale – Development of a Memorandum of Agreement prior to an inadvertent discovery is strongly suggested by the NAGPRA implementing regulations. Such an agreement can greatly facilitate and speed up consultations as required by law after an inadvertent discovery.

| Alternative | | Strategies |
|-------------|---|--|
| A | B | |
| | X | Identify Native American Tribes, Groups, and direct lineal descendants that may be affiliated with the Refuge lands. |
| | X | Open consultation process with affiliated Tribes, Groups, and direct lineal descendants. |
| | X | Define funerary objects, sacred objects and objects of cultural patrimony. |
| | X | Develop procedures to follow for intentional and inadvertent discoveries. |
| | X | Identify persons to contact for the purposes of NAGPRA. |

References

- Altman, B. 2000. Conservation strategy for landbirds of the east-slope of the Cascade Mountains in Oregon and Washington. Oregon-Washington Partners in Flight.
- Altman, B. and A. Holmes. 2000. Conservation strategy for landbirds in the Columbia Plateau of eastern Oregon and Washington. Oregon-Washington Partners In Flight.
- Baldassarre, G. A., and R. G. Bolen. 2006. Waterfowl ecology and management. 2nd ed., Krieger Publishing Co. Malabar, Florida, 567pp.
- Baldassarre, G. A., R. J. Whyte, E. E. Quinlin, and E. G. Bolen. 1983. Dynamics and quality of waste corn available to postbreeding waterfowl in Texas. Wildl. Soc. Bull. 11:25-31.
- Bolen, E. G. 2000. Waterfowl management: yesterday and tomorrow. J. Wildl. Manage. 64:323-335.
- Connelly, J. W., M. A. Schroeder, A. R. Sands, and C. E. Braun. 2000. Guidelines to manage sage grouse populations and their habitats. Wildlife Society Bulletin 28:967-985.
- Dugger, Bruce D., Petrie, Mark J., and Mauser, Dave. 2008. A Bioenergetic Approach to Conservation Planning for Waterfowl on Lower Klamath and Tule Lake National Wildlife Refuge. Unpublished paper.
- Fleskes, J. P., and D. S. Battaglia. 2004. Northern pintail habitat use and waterfowl abundance during spring migration in southern Oregon-Northeast California (SONEC). Final Report. U.S. Geological Survey, Dixon, California. 58pp.
- IMWJV (Intermountain West Joint Venture). 2013. 2013 Implementation Plan: Strengthening Science and Partnerships. Missoula, MT.
- Klebenow, D.A. 1985. Habitat management for sage-grouse in Nevada. World Pheasant Assoc. J. 10:34-46.
- Louv, R. 2005. Last Child in the Woods: Saving Our Children from Nature-Deficit Disorder. Algonquin Books. 390 pp.
- Mayer, T. D. 2005. Water-quality impacts of wetland management in the Lower Klamath National Wildlife Refuge, Oregon and California, USA. WETLANDS 25(3):697-712.
- Mauser, D. M., R. L. Jarvis, and D. S. Gilmer. 1994. Movements and habitat use of mallard broods in Northeastern California. J. Wildl. Manage. 58:88-94.
- Oring, L.W., Neel, L. and Oring, K.E., 2005. Intermountain west regional shorebird plan. Manomet Center for Conservation Sciences, Manomet, MA.
- Popham, G. P., and R. J. Gutie´rrez. 2003. Greater sage-grouse *Centrocercus urophasianus* nesting success and habitat use in northeastern California. Wildlife Biology 9:327–334.
- Reinecke, K. J., R. M. Kaminski, D. J. Moorhead, J. D. Hodges, and J. R. Nassar. 1989. Mississippi Alluvial Valley. Pages 203-247 in L. M. Smith, R. L. Pederson, and R. M. Kaminski, editors. Habitat management for migrating and wintering waterfowl in North America. Texas Tech University Press, Lubbock.

- Service (U.S. Fish and Wildlife Service). 1960-1973. Klamath Basin National Wildlife Refuge Complex. Refuge Annual Narratives. Refuge Complex files.
- Service (U.S. Fish and Wildlife Service). 2012. Revised Recovery Plan for the Lost River Sucker (*Deltistes luxatus*) and Shortnose Sucker (*Chasmistes brevirostris*). Recovery Plan. First Revision. Original Version: March 1993. Pacific Southwest Region. U.S. Fish and Wildlife Service. Sacramento, California.
- Weddell, B. J. 2000. Relationship between flows in the Klamath River and Lower Klamath Lake Prior to 1910. In 2001 Klamath Basin Fish & Water Management Symposium, edited by Y. Everett, M. George and A. King. Arcata, California.
- Yarris, G. S., M. R. McLandress, and A. E. H. Perkins. 1994. Molt migration of postbreeding female mallards from Suisun Marsh, California. Condor 96:36-45.